The Builder.

VOL. XXVI.—No. 1327.

Suburban Growth of London and Suburban Railway Accommodation.

SUBJECT has lately been brought prominently under public notice which is of great importance in relation to the growth and increase of the metropolis. We have ourselves not unfrequently called attention to the steady and rapid pace at which this increase proceeds, a rate which, if unchecked, will demand shelter within the limits of the London of A.D. 1900 for from six to seven millions of inhabitants. With increase of size we now see coincident transformation of character. The old nucleus of this immense group of parishes, cities, and boroughs, the City of London itself, is becoming more and more the *office* of the world. Stately buildings replace the ugly and cramped houses of the Georgian era, and these buildings are almost entirely parcelled out in offices. The City lives out of town. And not only the wealthier but the poorer inmates of these lofty rooms by day, escape to a comparatively less dense neighbourhood to snatch their few hours of sleep, and to bring up their numerous families.

In this architectural and social transformation of the central part of London the railways have had no small share. It is evident to those who have given due attention to the subject that no traffic pays like a metropolitan traffic. The powerful engines and well-managed trains of the underground railway conduct a constant stream of human life to and fro (without any apparent diminution of the crowds that fill the streets), that resemble only the march of an enormous army. While the interior traffic of the metropolis assumes such commanding dimensions, the suburban traffic is hardly less important. For the constant circulation of the former is substituted the steady tidal flow of the other part of the same great system. To reach the business centre from eight to eleven, to leave it from four to eight or even later, is the daily habit of a large mass of persons, who have become accustomed to arrange the whole routine of their business life on the assumption that a decent and reasonably paid service will be continued by the different railways.

To catch and to convey this steady and increasing stream has been, for many years, the great object of railway rivalry. A third line was created to snatch a portion of the wealth for which the Brighton and the South-Eastern Companies were flying at each other's throats. Nothing was too much to attract the public. Lofty and costly stations, so far in advance of the requirements of the traffic that they must be regarded rather as advertisements in brick, and glass, and iron, than as the provision made by public carriers for the accommodation of their customers, form the most prominent objects to be seen from London and from Westminster Bridges. Duplicate bridges of gigantic proportions span the Thames. Acre after acre of London has been denuded of its ancient roofing. And so headlong has been the race that the rival claimants, for instance, have found themselves not only out of breath, but out of pocket. Ruin came to stare them in the face.

Then succeeded that which took place in the good old days of the road. When the coach proprietors had come to the end of their tether in their efforts to ruin one another, it was their wont to combine. Up, then, went the fares which, in the attempt to underbid one another, had sunk almost, or (in one instance) altogether, to zero. The late rivals, now partners, charged their own prices; and it was only the possibility that some "outsider" might be tempted to come in for a share of the harvest (exactly as did the London, Chatham, and Dover Company), that kept the charges of the newly-combined opponents within limits. They had raced, at each other's cost, to catch the public. They now strove to make the public pay for their losses.

Within certain limits this kind of thing is quite consistent with our national peculiarities. These limits, to a certain extent, imposed themselves. The capital necessary to set up a stage-coach was not out of the reach of many a man with a turn for sporting. Any particularly "close" road would be likely to attract some of this floating capital. Private enterprise had offered certain facilities to the public. When those facilities were restricted, private enterprise might always be invoked to repeat its original effort.

But when, instead of hundreds of pounds laid out on horse-flesh or in coaches it became a question of millions invested in railways, the good old rule of leaving wrong to right itself ceased to be applicable. It was no longer a question of private enterprise; for, though the money invested in the new carrying business was that of individual proprietors, the conduct of the concern was by a corporation, and the powers of each corporation were given by *ad hoc* legislation. In the earliest legislation on the subject some idea of justice was apparent. There was a desire to protect the public, an uninformed desire, it is true, but still one evinced under the now exploded impression that Parliament was responsible for its proceedings. There was also, in the second place, an idea that the new property which thus, with no small amount of speculative courage and of professional skill, had been created under the incubation of the Legislature, should be protected from wanton assault. Thus men grew up, and went on, to plan the steady course of their daily lives on the strength of one or two assumptions the unpardonable folly of which is now apparent. First, they thought that Parliament would protect the public, and that in granting to certain individuals large powers, in the exercise of which all the earlier means of conducting the traffic of the country would be destroyed, provision would be made to insure a wise and fair use of those powers. Secondly, men took for granted that when difficulties had been incurred, property had been purchased and created, and the carrying trade had been placed on a new footing, such property would be protected from wanton attack. Thirdly, they thought that, certain laws having been passed on certain conditions, those conditions would be adhered to by the corporations, and would be enforced or respected by Parliament. In each of these three assumptions we reckoned miserably without our host. The least amount of public convenience was attained at the cost of an expenditure of which it is little to say that the half was unnecessary. No care or industry was allowed to count as a defence against wanton attack. The problem how to spend most money with the least advantage to the public at present, and in such a manner as to render future improvement all but impossible, was worked out by our railway legislators with full and unexampled success. Even this was not all. First, having thrown clean away ten shillings out of every pound they spent, in order to injure their neighbours, then having ceased to fight from sheer exhaustion, these great corporate malefactors, so soon as they met in truce, agreed on one point alone. They decided to kill the goose that laid their golden eggs, and they came to Parliament to hold the neck of the bird while they did so. The House of Commons gaily and instantly assented. Had it not the mission to take a grand leap in the dark—and could it be bothered by trumpery questions of public faith or utility? The men who objected to have their fares doubled on them were probably non-electors. Even if they were electors, were not the chairmen of the railway companies M.P.s? Who could care for the inconvenience of printers' devils and those low sort of people when it was a question of passing a Bill supported by honourable members. So the House of Commons readily gave power to the companies to reverse all former bargains, and to make the public pay through the nose for the wasteful squandering of an internecine feud. It was a characteristic way of making things pleasant.

The House of Lords had a little more scruple: not inaccessible to the force of the argument that money was wanting, and was only to be squeezed out of the public, it yet scrupled to hand over the whole South-Eastern traffic of the metropolis, with its suburbs, and with the world at large, to the unchecked power of persons who had shown such utter want of consideration for the public interests, or of wise cultivation of their own. The small end of the wedge their lordships admitted, but they scrupled to show the perfect indifference to the need of the people, proper to the people's House.

The subject is one on which it may indeed be pardonable to use the language of ironry, for it is the only refuge from that of shame and of anger. It shows a miserable inefficiency in our boasted institutions, that the vital interests of thousands should be thus exposed to the sport of any greedy assailant. Omitting any further reference to the earlier stages of an inconsistent and discreditable legislation, let us look at the vested interests that have sprung up around even the present ill-conducted union of the South-Eastern systems of railway. Even while the only reason for a Brighton train starting at any fixed hour was that a Dover train started at the same time, New Cross grew into a succursal of the city. Croydon became as Clapham or as Camberwell. The dense population of middle London spread itself out to breathe along the Kent and Surrey lines. Discouraged, as far as possible, by railway mismanagement, the true friends and supporters of railway traffic swelled the dividends in spite of the directors. What might have been done had a wise attention to the wants of the public, and thus to the true interests of the shareholders, been paid by the several Boards, let the returns of the Metroplitan Railway indicate. But even as it is, thriving and growing colonies have sprung up all along these ill-managed lines, which the directors cannot uproot without the aid of Parliament. It is not their fault. They have done all they could to drive the smaller occupiers of house-room back into the crowded city. They threaten, if refused their new powers, to do still more to spite their own shareholders.

Once and again has it been pointed out that the evil state of the South-Eastern Railways is to be amended, not by the application of the principle of protection, but of that of free trade. Let the managers set themselves to develop their traffic according to the rules of common sense and of railway experience. Let them economise in the distribution of trains. Let them conduct the traffic so as at once to suit the

convenience of the public and to avoid that duplication of every item of expense which is the peculiar feature of the district. In spite of the large sums laid out on the stations, the arrangement of the tangle of lines between New-cross, London Bridge, Cannon-street, and Charing-cross is such as to leave no element of danger and disturbance out of play. All depends on the accurate use of a complex system of signals. Every train runs over the line of other trains. Every passenger (almost every passenger) from Charing-cross to London-bridge is sent to Cannon-street by the way. In other words, except in the few trains that run direct, every passenger carried from Charing-cross to London-bridge, or *vice versa*, is so carried at a double expense. If it pays to take a third-class passenger in this awkward fashion for twopence, it would pay as well to take him in half the time for a penny.

We might speak of the neglect of mechanical law which is evinced in the unnecessary weight, and rigid structure, of the engines and carriages. Into this subject, however, it is impossible to enter in a few words. It is a question of great pecuniary importance to the shareholders. But the jumble of up and down lines on the same level is a question of life and death to the public. To avoid a constant choking, which is not always avoided, great expense and considerable danger are daily incurred in the working of this group of railways,—unnecessary expense, and unnecessary danger. It is probable that some frightful accident will some day give weight to the remonstrances which we do not now for the first time utter.

To all householders, residents, or proprietors of London, the subject is one of direct and lively interest. The method of suburban extension is intimately connected with the mode in which Parliament enforces the faith of contracts, or hands over the poorer classes who earn their bread in London to the short-sighted greediness of the railway companies. Nothing can be more unsatisfactory than the manner in which the advocates of the latter bodies have conducted themselves when driven to appear in print. Questions of justice to the poorer (but yet the more valuable) customers, who have fixed their humble suburban dwellings in reliance on Parliamentary faith, and on fair and ungrasping arrangements for their accommodation, have been entirely ignored. "I have made a most extravagant outlay. I am out of pocket. Therefore the public must pay." Such is the argument of the embodied railway interest. "Other people have gained something by our expenditure. Land has risen in value near our stations, and people have been indecent enough to sell land at this increased value, or to buy it in hopes of a still further rise; therefore we shall double our fares," was another argument. Public faith, adherence to contracts on the strength of which Acts of Parliament had been obtained, convenience of customers, wise development of traffic by giving facilities of travel at low cost, — acknowledgment of error in past contests,— all these things were entirely ignored. The applications to Parliament, and still more the letters of the applicants, have taught the public that nothing whatever is to be expected from the directors, except what they are compelled to do, and that the contentious and ungenerous spirit which has long regulated the relations of board with board may be expected for the future to preside over those which subsist between carrier and customer.

Secondly, if neither kindness nor true prudence can be expected of the boards, it is clear that still less can any aid be looked for from Parliament. But for one or two public-spirited members of the House of Lords the measure which the chairman of one of the companies described in the columns of the *Times* as an application to Parliament to allow of the *reduction* of fairs, would by this time have been law. Owners and occupiers must watch future applications to Parliament for themselves.

Thirdly, and even more important than the convenience of the colonies along the Kentish lines, or than the future traffic returns of the companies, is the architectural question,—the mode in which the future development of London will be influenced by the greater or smaller amount of good faith and good sense shown by the managers of the South Eastern lines.

The present tendency of building is to expand along the course of their railways, not in dense lines of streets, but in villa or even cottage residences, each furnished with a breathing-ground in the way of garden or paddock. Of all the forms of that great evil, agglomeration of habitations, this is the least obnoxious. Again, the physical features of the ground, the lofty hills which catch the breezes from the Channel, the chalky and sandy soil, the fact that the prevalent winds carry off the products of vitality and of combustion to the open country, instead of pouring them on to the already asphyxiated town, are all arguments in favour of that method of suburban growth which can only be checked by the blindness or by the greediness of the railway companies.

There is no room to doubt that had the Amalgamation Bill been passed (for it is childish to speak of its being passed and not acted upon by its promoters) the first result would have been to force back into London itself a dense population which has just escaped from its confinement. The next result would have been to check the wholesome and rational style of building which is now dotting over the district between Camberwell and Croydon. The third would as surely have been the covering, with regular lines of unbroken street, of that wide flat sweep of meadow land between Bayswater and Kilburn, and even Hampstead, which is now the only inlet by which fresh western and north-western breezes can enter to ventilate the metropolis. With the level district about Kensal-green turned into a manufactory of smoke and of carbonic acid, and covered by that alternation of lofty houses, and of dense small streets, crowded with shops and with mews, which characterizes the Bayswater quarter, the more habitable part of London will be reduced to a state of permanent gloom and stagnation such as that which now prevails in the most unhealthy neighbourhoods. The North-Western, the Midland, the Great Western lines will thrive at the expense of those south of the Thames. London will extend to Slough, to Stanmore, and to Elstree, and we shall be advancing rapidly towards the fulfilment of the old prediction which spoke of Highgate-hill as the future centre of the metropolis.

RESERVOIRS AND WATER SUPPLY.

A CORRESPONDENCE has appeared in the leading London papers on the subject of the realization of the surplus water of rivers and brooks of this country, for the uses of the population situated on their respective drainage areas, and a claim has been put forward for certain persons as the originators or discoverers of that provident and useful system of storing up the redundant waters as near the rainfall as possible, so that an ample supply of good and pure water may be obtained at all seasons for the supply of the inhabitants; and it is suggested that a large debt of gratitude is due to those far-seeing and discerning men for having made the discovery, and sketched out a scheme that may be put into a practicable shape, and so lead to a good and matured plan to effect this very necessary and desirable object.

To show how futile and upon what slender grounds these claims are propounded, we may observe, that to collect and impound water in rainy seasons as proposed, is of very ancient origin. In Eastern and all tropical countries water has been collected and stored in reservoirs from a very remote period; and perhaps in this place it may be interesting to draw attention to a few examples of these ancient works used for storing water for the supply of large populations.

The Romans, in the acme of their glory and the zenith of their greatness, bestowed considerable attention on the water-supply of towns that came within their dominion; and it is said that at one period they had no less than twenty aqueducts for the supply of the city of Rome, and so abundant was the supply, that Strabo remarked that "whole rivers flowed through the streets of Rome."

Many of their aqueducts took their supply of water from springs and streams situated many miles from Rome; the number of reservoirs situated at various points, to store up and keep the water pure and cool, exceeded 1,300; and the supply of water at one period amounted to fifty million cubic feet, while the population of Rome at that time was about one million: the quantity was therefore equal to 50 cubic feet per head of the population.

This water being procured from elevated springs and streams was conveyed through their particularly strong and enduring aqueducts of masonry, many of which are now in existence, having endured the wear and tear of centuries, to covered reservoirs; so the water was at all times deliciously pure and cool; and even this system of protecting the water from exposure is handed down to us from tradition.

But although the Romans constructed no large impounding reservoirs at their ancient city strictly of the kind alluded to, they left many important examples in those countries that became subject to their domination; and we may instance Constantinople, by way of example, as affording a clear and lucid type of their practical knowledge of the mode of obtaining water from gathering grounds and impounding it in large reservoirs, and thus delivering it by means of their favourite aqueducts, and other means, to supply the inhabitants.

The site upon which the city of Constantinople is erected is very remarkable, and surpasses in many respects that of any other city in the world. It is erected on a triangular peninsula composed of seven hills, and two of its sides are washed by the seas of Marmora and the Golden Horn, and besides having a considerable elevation in parts, it is surrounded with views and prospects of the most beautiful and enchanting character, and scenes of the most picturesque grandeur.

Constantinople was originally supplied by means of water collected from the roofs of houses, and stored up in reservoirs beneath them; but the quantity of water so collected was found insufficient for the wants of the Turks, whose peculiar religion requires frequent ablutions; besides, it became impure from various causes, which rendered the water unfit for use.

Fortunately another source presented itself to the enterprising Romans, from which a profusion of water could be obtained for the supply of the city, and this source was situated on a range of mountains to the north of the city, and bordering on the Black Sea. As the frequent rainfall on this mountain range produced a large supply of water, and numerous streams flowed down the valleys and ravines, the idea occurred to construct mounds at certain elevations across these valleys to intercept the different descending streams so as to impound and preserve the water for the supply of the city.

Six large almost triangular-shaped reservoirs are there formed, some of great depth and capacity, and the mounds erected to dam up the water are of great breadth and height, and being faced with white marble finely sculptured in the Oriental style, they exhibit a bold and magnificent appearance; and these sources of supply are religiously guarded and preserved, and heavy penalties inflicted for injuring or improperly abstracting the water.

The aqueducts that supply the city are four in number, and constructed on the well-known Roman system: one of the structures is 440 ft. long, and 107 ft. high, with a double tier of arches, one over the other, supported at intervals with strong buttresses; at others the valleys are crossed by means of "souterazi," or water towers. The water descends a lead pipe affixed to the tower on one side and ascends on the other, and at the top of the tower is a small basin to permit the escape of the air from the conduit, so as to relieve the pressure on the pipes.

A capacious reservoir contiguous to Constantinople, receives the water from the impounding reservoirs and distributes it gradually over the city, through the various conduits, for the supply of the Seraglio of the Sultan, as well as the numerous fountains that usefully adorn the different parts of the city.

To show the extent and magnitude of ancient reservoirs, we may mention the Imperial reservoir at Constantinople, said to have been built by Justinian, the ruins of which now remain in a very perfect state.

The reservoir is 336 ft. long, 182 ft. broad, and 40 ft. 9 in. high; the sides, arches, and roof are all of brick, covered with tarrass; and the roof is supported by 336 marble columns, the capitals of which were of the Corinthian order of architecture; the intercolumniation is 12 ft., and each column is 40 ft. 9 in. high, and they stand in regular ranges, twelve in one direction and twenty-eight in another.

Over the abacus of every pillar is placed a large stone, which forms the bed course which supports the arches that spring from the tops of the columns, and which form the vault or roof.

This is a very remarkable and interesting reservoir or cistern; its mode of construction is on a large and magnificent scale, such as usually characterizes the works of the wealthy and luxurious Romans, and stands out in strong

contrast to the constructions of the present age, which are commonplace and rude in comparison. We do not desire to imitate them in boldness of design and splendour of execution, but rest ourselves satisfied with roughly hewing our works out of the commonest material.

In Spain and Portugal are many remains of Roman works of equal interest carried out in a similarly bold and comprehensive scale, evidently showing that that enlightened and enterprising people were far advanced in the knowledge of the laws that govern health and sanitary science, and a study of their remarkable works affords us good examples and precedents, and doubtless will do to remote generations, when many of our modern erections shall have crumbled away to their original dust.

In all tropical countries, particularly the East, it has for generations been the custom to store up water for the use of the population, and for irrigating the land for the purposes of agriculture; and one stupendous reservoir in that wonderful country (India), we may mention, is of extraordinary extent; it is situated at Hussein Segur, Secunderabad, Deccan, and was made, it is supposed, about the middle of the sixteenth century.

It covers an area of about 2¾ superficial square miles, or 1,760 acres in extent. Its principal embankment is upwards of 1 mile long, 30 ft. to 40 ft. broad at top, at the deepest part, and gradually narrows towards each end of the embankment, and it is 72 ft. high. The fore slope is 1 to 1, rear slope, 2 to 1, and the face of the inner slope is pitched with large blocks of granite.

The level of high water is maintained at 12 ft. below the top level of the bank. There are many other works of a similar character in that very extensive and interesting country, which cannot be referred to in the limits of this paper. In the course of the recent expedition to Abyssinia, Aden was visited, and some interesting tanks examined there, which are objects of archæological attraction. On the face of the steep rocks, wherever there are any channels for the rainwater to find its way to the plain below, are erections which appear like fortifications, but are in reality tanks for water.

At the head of the plain is a circle of hills which surround Aden, and a ravine descends therefrom; and here are very extensive and massive tanks, built of very solid masonry, very deep, and are lined with a white cement. They are said to be large enough to contain water for Aden for two years, but we understand they contain about thirty million gallons.

These tanks are of extreme antiquity, and were only discovered three or four years ago. They were completely covered up with the *débris* brought down by the heavy rains of ages past, and their existence was unknown or unsuspected.

They have been cleared out with great labour, and were found to be in as perfect condition as when they left the builders' hands, which is supposed to be about the sixth or seventh century.

It is quite a mystery by whom these tanks were built; but it is supposed to have been by the Egyptians, who at one time possessed a very extensive territory, and in that case these tanks were not improbably contemporaneous with their celebrated Pyramids. The discovery of these tanks is most important, both on account of the shipping calling there, and the garrison, as rain only falls at Aden once in every four or five years, and then it comes down in such torrents as to fill the tanks in a very short period. Another interesting and ancient tank was found some time ago in the Island of Ceylon, it is called the Pathavie Tank, but it is now in ruins. It was discovered in the great central forest of the Wanny, about seventy miles north of Trincomalee, and twenty-five miles from the sea.

It is considered the largest as well as the most perfect of the extraordinary works of this island, and which possesses about thirty of these immense tanks, and from 600 to 700 others of smaller capacity, scattered about the island, many of which are repairable.

The Pathavie Tank occupies the basin of a broad and shallow valley, about twelve to fifteen miles long, with a breadth varying from six to ten miles.

The embankment by which the waters were accumulated within this area is nearly seven miles long, 300 ft. broad at the base, tapering to 20 ft. at the top, and upwards of 60 ft. high, formed throughout its whole length by layers of squared stones.

One of the existing sluices consists of hewn stone, 6 ft. to 12 ft. long. These run into ponderous wells immediately above the weir, which regulates the escape of the water. Each layer of the work is kept in its place by frequent insertion, endwise, of long ties of hewn stone, whose extremities project beyond the face of the work with an enlarged head, so as to prevent the courses being forced out of their places.

The projecting heads of these ties are carved with elephants' heads and other devices, somewhat resembling the extremities of Gothic corbels.

The front embankment of this reservoir has been estimated to contain 7,744,000 cubic yards of stone, and the cost to have been, for that portion of the work, above 870,000*l.* sterling.

At some unknown period a breach was effected in the embankment about 200 ft. long and 100 ft. broad, which injured the efficiency of the works, and which was never repaired; and this remarkable reservoir is thereby rendered perfectly useless.

Having quoted a few examples of remarkable ancient reservoirs, we will now call attention to a few of the extraordinary works of this kind in this country. It was the establishment of the canal system that first drew the attention of engineers more particularly to the execution of reservoirs on a large scale as receptacles for storing water, and these were usually formed by choosing a suitable site in deep and narrow valleys or ravines, generally above the level of the summit of the canal it was intended to serve; so that a regular supply of water could be obtained at all times and seasons for the passage of boats, and also to supply the locks constructed for the purpose of transferring the boats from one level to another.

Many of these reservoirs are of considerable extent and executed most substantially and with considerable engineering ability and skill, and several of them are placed in situations where the geological formation is not well adapted for them, on rock, or porous strata, or other objectionable sites, but, still, the best that could be selected in point of level to afford the supply of water required.

If we cursorily examine the sections of country over which our canal system has been carried, our readers will be able to appreciate a few of the difficulties our old canal engineers had to contend with in the execution of such works; and as these have been ably surmounted with substantial and enduring works by their indomitable energy and perseverance, it redounds more to their honour and fame, and no failures are recorded, or even hinted at, to tarnish them, which cannot be said to be the case in the present day, as several of our important works are stated to be not quite free from serious defects. In running our eye over the sections of the respective canals at that time forming main arteries for the traffic of the country, taking the one from Liverpool, by way of Birmingham, to the river Thames at Limehouse, a distance of 262 miles, we cross four summit levels,—first at Harecastle, 420 ft. above low-water at Liverpool; another at Knowle, 380 ft. above low-water; another at Braunston, 365 ft. above low-water; and another at Tring, 395 ft. above low-water at Liverpool, and the Thames, of course. To supply these summit levels there are series of reservoirs and locks on the line, to pass the boats up and down the inclines.

On this line of canal there are some very interesting examples of reservoirs, and amongst them I may mention those of the Grand Junction Canal Company. These are situated at the following places, and of the capacity and depth enumerated below:—

Daventry	7,205	locks of water...	35 ft. deep.
Drayton	1,337	,,	26 ,,
Marsworth	994	,,	18 ,,
Stanhope End	2,296	,,	24 ,,
Tring	1,016	,,	20 ,,
Wilston (old)	1,413	,,	15 ,,
Wilston (new)	1,413	,,	18 ,,
Weston	1,856	,,	22 ,,

Each lock is computed to contain 9,000 cubic feet of water, so that the largest of these reservoirs (Daventry) would be capable of holding 64,845,000 cubic feet of water, and the whole series of reservoirs 167,770,000 cubic feet, for the supply of this particular canal.

But the highest of these reservoirs (Marsworth) is 31 ft. below the summit level at Tring, and the water has to be pumped up to supply that level, and also as there are various levels, to pump the water from one reservoir to another, as a very small supply only is received from the springs and other sources in the vicinity, the summit level requires to be kept regularly supplied to meet the demand required by the lock for each boat, as it carries a lock of water (viz. 9,000 cubic feet) in descending to the lower levels.

The date of the execution of these works varies from 1793 to 1795.

Another important line of navigation is from the River Severn at Bristol, by way of Devizes, to the River Thames at London Bridge, a distance of 178 miles; and on this line we cross only one summit, at Crafton, which is 474 ft. above the level of the English Channel. This line is principally supplied from rivers, and the date of the first Act is 1794.

The aqueducts, bridges, tunnels, and works of this canal are of superior construction and excellent workmanship, the fruits of a master mind, the late John Rennie, C.E.

Another important line of navigation proceeds between the ports of Liverpool, Goole, and Hull, making a distance of about 159 miles: in this distance one summit level is crossed near Stanfield, which is 600 ft. above the level of low water at Liverpool and Hull.

The water for the supply of this line of canal is taken from the rivers and brooks in the vicinity of it, and forced up by means of pumping machinery to the summit levels, from whence it is locked down to the Duke of Bridgewater's Canal one way and the Aire and Calder navigation the other. The date of the first Act for this work is 1794.

On many of the canals there are other interesting reservoir works: on the Barnsley Canal the Hiendley Reservoir is 127 acres in extent, and has a depth of 40 ft. of water, and this is supplied by means of pumping from the long level when full, and is returned to the canal in droughty seasons. The date of the Act for this canal is 1793.

The Birmingham system of canals is also of considerable magnitude, connecting the town of Birmingham with the South Staffordshire coalfields and the rivers Trent and Mersey. The works that have been executed on this line of canal by the late Messrs. Telford & Walker are of the heaviest description.

The supply of water is obtained for lockage from many of the old coal works, raised by steam-power, and there are service reservoirs at Smethwick and near Oldbury; and these being found inefficient to supply their extended works, another reservoir was made at Rotten Park, near Birmingham, by the late Mr. Telford: it was constructed of 80 acres in extent and 45 ft. deep, and to supply this reservoir a feeder was carried from the Oldbury Reservoir to connect them together, contouring the country over ridge and dingle in such a manner as to intercept all the flood-waters of the county, and to conduct it to the great reservoir at Rotten Park. The date of these works was about 1824.

On the Birmingham and Liverpool Junction Canal there are also extensive reservoirs, one of fifty acres at Belvide, and another at Knighton of fifty acres, to supply the lockage of that canal, but their main supply is derived from the Birmingham Canal summit, with which it is connected near Tettenhall.

The Cromford Canal is supplied chiefly from feeders at the Cromford end, and also by reservoirs near the Butterly Iron Works of fifty acres in extent, containing when full 2,800 locks of water, or 25,000,000 cubic feet; besides, there are two other reservoirs of twenty acres and fifteen acres in extent respectively, one of which is situated at the eastern end of the great tunnel, and another where the Pinxton branch commences; besides, the summit level of the canal, which is fourteen miles in length, acts also as a reservoir in consequence of being made of 1 ft. extra depth of water than is required for the traffic, and this would supply 2,117,600 cubic feet of water. The date of this canal is about the year 1790.

The Ellesmere and Chester Canals are also an extensive system of canals connecting the Mersey with the Dee, and the Montgomeryshire Canal in Wales with sundry branches. It takes its supply of water from a natural reservoir, the Bala Lake, by means of a feeder carried up from the celebrated Pontycysylte Aqueduct to Llandyssilio. This supply of water not only affords lockage down to the Dee and Mersey, but also in the other direction towards the Birmingham and Liverpool Junction Canal.

In consequence of the quantity of water supplied from Bala Lake being in excess of the amount required for lockage, a very fine and interesting reservoir was formed at Hurleston, in Cheshire, for the purpose of collecting the surplus water of the upper pond locks, and

supplying the lower in times of scarcity; the area of this reservoir is twenty-four acres, and the greatest depth 40 ft., and its cost was said to be 31,200*l*. The date of this work was 1830.

The English and Bristol Channel canal carried out in 1825, has also some very interesting reservoirs; the canal itself is 90 ft. wide, and 15 ft. deep. It is supplied from several reservoirs in the Axe valley, near Seaborough, covering a surface of 217 a. 3 r.; and another in the same valley at Winsham, a third at the upper end of the valley of the Yarty, near Hillhaven bridge, of 105 a. in extent; and another at the Ridge of 16½ a. The two last mentioned reservoirs are connected together by a cut of 6½ miles long, and from the Ridge reservoir to the canal the feeder is 3½ miles long.

The Forth and Clyde canal is also another important undertaking; it is 35 miles long, and its summit level is about 155 ft. above low water on the Clyde, and it affords a passage for vessels drawing 10 ft. of water from the Irish sea to the German Ocean. Its summit level is supplied with water from reservoirs, one of which is at Kilmananmuir of 70 a. in extent, and 22 ft. deep; and another at Kilsyth of 50 a. in extent, and 24 ft. depth of water. The date of the first Act for this work is 1768.

The Nottingham canal, made in 1802, although a short line of 15 miles, and is connected with the Cromford canal and the river Trent, has a large reservoir at Amworth, with a self-regulating sluice whereby 3,000 cubic feet of water per hour, or 72,000 cubic feet per day, is allowed to the Erewash canal and certain mills on the line, reserving sufficient for their own wants.

In addition to those reservoirs above-mentioned, we may state there are several others: one on the Carlisle canal, one on the Croydon, two on the Dearne and Dove, one on the Dudley (Cradley Pool), one on the Huddersfield, containing 20,000 locks of water, or 180 million of cubic feet, one at Darnall, and two others on the Sheffield canal, of 32½ acres in extent; one on the Stourbridge canal, at Pensnet Chase, of 12 acres area; two large reservoirs at Earlswood, on the line of the Stratford-on-Avon canal; one on the Trent and Mersey canal, at Knypersley. The Grantham canal has two reservoirs, one of 20 acres extent at Denton, and the other of 60 acres at Knipton. On the Leeds and Liverpool canals, near Fowlbridge tunnel, there is a reservoir of 104 acres in extent, containing 32,400,000 cubic feet; the Peak Forest canal has two large reservoirs, the Todds Brook, containing 47,412,270 cubic feet, and the Combs reservoir, containing 54,289,000 cubic feet. The Macclesfield canal has two reservoirs, the Sutton, containing 12,817,000 cubic feet, and the Bosley reservoir, containing 64,266,399 cubic feet; these latter were recommended to supply Manchester with water, before the present water-works were laid out and made, and would certainly supply very pure water.

Besides the examples above given, there are many others situated in different parts of the country of equal extent and interest, but we believe we have enumerated many of the principal reservoirs, and the construction of several of them dates back to the latter end of the last century, so that the idea of conserving and using the water for the supply of canals, irrigation works, mills, &c., dates back to a very remote period; and many of these works are of great extent and large capacity, much greater than are generally adopted for the supply of our towns; and it is idle to suppose that the idea is a modern one, or that any one person can reasonably claim the merit of their invention.

In the same way as the water is collected and the rainfall economised for the uses above mentioned, it may be collected on the respective water-sheds of our rivers, and used either for the proper water supply of the inhabitants, to irrigate the land for agricultural purposes in dry seasons, or to aid the navigation of rivers where navigable, or to assist in cleansing and purifying them by flushing, until legislative measures can be generally adopted to prevent their being fouled by the sewage of towns, villages, manufactories, or other improper means.

And in this place we may observe, that we have drawn attention more particularly to those vast stores of water supply situated in different parts of the country, as a few examples out of the many that exist for the supply of our system of canals as a means of transit for goods, &c., that are daily growing obsolete and into disuse, occasioned by the rapid and more certain system of railway locomotion; and as the former becomes abandoned or broken up, it assumes a question of serious import whether we ought not to avail ourselves, where practicable, of this vast system of storage of water collected in the country, and not used, or only partially, as a preliminary measure, and in aid of the one propounded for rendering available the complete rainfall produced upon the drainage areas of our respective rivers and their tributaries for the proper supply of our growing population in times of drought and scarcity.

As it is likely that legislation will be protracted in consequence of the time required in the examination of the state of the rivers, holding inquiries, and reporting on the state of the same, and then to found a measure thereupon, would it not be advisable to pass a short Act, so as to put a peremptory stoppage on the present system of fouling our rivers, and to force upon the authorities of towns the absolute necessity of applying an immediate remedy to this monster grievance?

The passing of the Thames Conservancy Act is one of the best measures that has emanated from Parliament for many years past; and we understand by instructions given to the official staff, that it is intended to be carried out to the letter and spirit of the Act; and this is as it should be. After well-considered and matured measures have passed the Legislature, they ought to be carried out in all their integrity, and not left, like many of our health and sanitary Acts, to be carried out only so far as agreeable and pleasant to the ruling magnates.

If the rainfall on the water-sheds of our rivers is to be collected and utilized, as proposed in a former part of our journal, some strong and efficient measures must be adopted to dispose of the sewage refuse of our towns, otherwise our water-supply will continue to be contaminated as hitherto with the sewage. The great object should be to collect the water as pure and as near the rainfall as possible, and to pass the sewage beneath the soil, so that it cannot appear again upon the surface, except as supernatant water, purified by its filtration through the upper strata, depositing the whole of its varied fertilising matter in the soil as food for vegetation.

In tropical countries where scarcity of water frequently exists, every drop is carefully collected and stored up for periods of scarcity; and it is quite an unaccountable anomaly that in a country like ours, blessed with copious rainfall at frequent intervals, and droughts are few and far between, that the cry should be anywhere, "Water, water, and not a drop to drink," that millions of gallons should be allowed to flow back to the great ocean unstored or unutilized while any living creature should stand in need, at any season or period, of this indispensable and vital element of life.

We think we have shown satisfactorily that the very useful adjuncts to our water supply, reservoirs, are of rather ancient origin, and that it has been a work of time and of close study of many clear heads to arrive at the present stage of knowledge possessed by professional men on this subject; but as the data on the proper construction of reservoirs, as we observed in our article on "Water Supply," is not very well understood, and different formula are used by eminent practitioners in the construction of such works, we have an idea that in a future article we may draw attention to these differences and discrepancies, examine into the methods adopted in ancient works and those of our old engineers, so that we may deduce therefrom a data and theory founded on practice and experience that may serve as a guide in the future.

CEDAR AND ITS RELATIONS.*

IN pointing out some of the practical purposes to which cedar is applicable, we must, of course, give the first place to carpentery. Such uses in ancient times were confined to the Oriental nations; and in our own times, with the exception of Japan and some of the islands of the Indian Archipelago, to the continent of America. The boundless forests of the Amazon and the Mississippi supply, as we have seen, much larger scantlings of the timber than could ever have been obtained from Lebanon. Nevertheless it is to Lebanon we must go back for the highest illustrations of its original and most magnificent applications to the purposes of building.

Sir Christopher Wren had a curious hypothesis with regard to the construction of the Temple of Dagon by the Philistines. This was probably a quadrangular pile of buildings, having a court in their centre; but he conceived to himself a vast roof of cedar beams resting at one end upon the walls, and centering at the other upon one short architrave that united two cedar pillars in the middle. Such a method of construction would doubtless render the celebrated feat and dying effort of Samson intelligible; but this view, as we have said, was merely an hypothesis. It is to the minute and graphic account which is furnished by the sacred historian respecting the building of Solomon's Temple that we must look for the earliest authentic account of the carpentry of this valuable timber.*

We need not recapitulate the details of that ancient and honourable contract which Solomon made with the King of Tyre. Let us call attention to one or two of its features which are still worth the attention of our modern political economists. In the first place, the wise monarch makes no attempt to conceal the want of "technical education" on the part of his own subjects. "For thou knowest that there is not among us any that have skill to hew timber like unto the Sidonians." At the same time, although the pastoral tribes of Israel could not hew timber, they had plenty of corn and oil, which they were willing to exchange for this architectural skill. In order to see that this exchange was equitable, agreeable, and profitable to both parties, let us simply note the result. "And there was peace between Hiram and Solomon; and *they two made a league together.*" Is there anything, we should like to ask the question, so antiquated in this simple but sacred principle of those ancient Syrian monarchies that the governments of modern Europe and America could not find it their interest to act upon it? In the second place, although Solomon did not set his subjects up as skilled artisans equal to those of Tyre and Sidon, he made no difficulty about supplying a host of inferior labourers, "three score and ten thousand that bare burdens, and four score thousand hewers in the mountains." This is a lesson in the division and *subordination of* labour that might be usefully taken to heart by our Irish fellow-subjects, when contrasting with their own passionate and heated imagination the comparative merits of the condition of England and that of Ireland. Once more, we are told that Hiram delivered the timber and stone-work in a finished state; "so that there was neither hammer, nor axe, nor tool of iron heard in the house while it was building." The circumstances, in fact, were these. The river Adonis was in the vicinity of the forest of Lebanon, and discharged itself into the Mediterranean Sea near Biblos. Accordingly Hiram could transport the timbers all squared, and not only cut to scantling, but cut so as to occupy the place each timber was to occupy in the building. From Biblos those rafts might easily be sent down the coast, and landed at Joppa, the nearest port to Jerusalem. On this most singular circumstance we will only remark that Solomon, with all his wisdom, would not have been able to do such a thing—at all events, in England,—in the nineteenth century. Our wise carpenters, bricklayers, and stonemasons have far too much good sense to permit their timbers to be worked in the forest, their stones at the quarry, or their bricks in the field, even although it can be demonstrated that the builder would obtain a better article, save much time and the cost of transporting superfluous materials. Whether they are wiser in their generation than Solomon is a question which we will not stay to determine.†

To proceed. The roof of Solomon's Temple was constructed with beams and boards of cedar, as well as the lining or panelling of the walls, and even the foundations. We must always remember, however, that the Eastern customs of construction respecting the roof are very different from our own. We construct our ceilings with plaster, and our floors with wood. They, on the other hand, construct their floors of plaster or painted tiles, and their ceilings of wood. As to foundations of timber, these, of course, are only possible in a dry, porous, sandy soil, such as that of Palestine. We need not dwell on the cedar ornaments of the Temple; indeed, the whole timber used, even to the most minute finishing or decoration of that celebrated

* See p. 366, *ante*.

* 1 Kings, v. vi.; comp. 2 Chronicles, i.

† We cannot call to memory—it is curious—a passage of any modern political economist wherein these important Scriptural illustrations occur.

Temple, was composed of cedar. The altar was of cedar overlaid with gold, the oracle was of cedar, "and the cedar of the house within was carved with gourds and open flowers:* all was of cedar; there was no stone seen."

Cedar timber, thus so lavishly used by David and Solomon in their buildings, was also, we read, used in the second temple rebuilt under Zerubbabel. The timber employed was cedar from Lebanon.† Cedar is also said by Josephus to have been used by Herod in constructing the roof of his temple. And the roof of the Rotunda of the Church of the Holy Sepulchre at Jerusalem is said to have been of cedar, and that of the Church of the Virgin at Bethlehem to have been of cedar or cypress.‡ Nor was the use of this famous tree always confined to the purposes of house building; it was sometimes employed, we are told, even in shipbuilding. The Prophet Ezekiel tells us (xxvii. 5) in that valuable historical account of the ancient Phœnician commerce—then at the period of its greatest prosperity (B.C. 600)—that the Tyrian shipbuilders constructed their shipboards of the fir trees of Senir, and their masts of the cedars of Lebanon.

It should always be remembered, however, in speaking of the cedars of Lebanon used in building by the ancient Jews—particularly when beams, pillars, or ceiling-boards are mentioned—that it is extremely probable the wood of more than one tree was employed. The generic name, indeed, of the tree was used. But under that name (*Pinus Cedrus*) were also (as Dr. Boyle has shown) § comprehended the *Cedrus deodora*, the yew (*Taxus Baccata?*), and the Scotch pine (*Pinus Sylvestris*). The latter tree might have furnished the material of the ships' masts mentioned by Ezekiel, which recent commentators consider was the case.

In our day the chief consumption of cedar for building purposes lies in the States of South America. There is a species of cyprus called white cedar in the Brazilian territories, which is valuable timber; and in Bermuda and other islands of the West Indies a brown quality of wood is much employed. The tree gives the name to a range of hills called the Cedar Mountains, in Cape Colony, which supply the township of Clan Willans and its neighbourhood with planks for building. It is very little known in Africa, although the cedar of Algiers is compact, very durable, and said to be susceptible of a high polish. But the Japanese employ a species of cedar, which, however, Thünberg describes as a kind of cyprus,—a beautiful wood that lasts long without decay,—in building bridges, houses, and even ships.‖ Cedar is now seldom employed in England or the Continent for building purposes, although there is a species indigenous to Spain and the south of France, which possesses many of the essential requisites. Indeed, there seems to be as great a difference between the various qualities of cedar as there is between the Scotch fir and the Norwegian pine; and it is obvious that the ordinary tables of strengths of materials must be grossly defective when they speak of cedar as representing a constant quantity, as most of them do. The fact is, in many of its physical qualities, particularly in its powers of resisting strain or compression, it is much inferior to the most ordinary description of yellow pine. It is seldom fine-grained or sufficiently compact to take a high polish, and the green timber is extremely prone to crack and rend in the process of drying. Its colour, indeed, is varied, and often beautiful, and its capacity for being easily worked is very great. But it possesses one simple feature which distinguishes it and gives it a value above all other trees of the pine tribe, and that is the important quality of durability.

Pliny tells us that the durability of cedar was proved by the duration of the cedar roof of the Temple of Diana at Ephesus, which had lasted 400 years; and at Utica, the beams of a temple of Apollo, constructed however of Numidian cedar, lasted 400 years.¶ It was on this account —*propter æternitatum*—that Vitruvius recommended it to be employed in the construction of temples and other public buildings, and particularly in the formation of statues to the immortal gods.* It is not so much prized for those sacred or ecclesiastical purposes in the present day; but that is not owing, as we shall see, to its properties of durability.

This unrivalled quality is undoubtedly owing to the essential oil of its resin. The wood, cones, bark, and even the leaves of the best species of cedar are saturated with resin, of a peculiar and powerfully aromatic odour, a slightly bitter taste, and a rich yellowish brown colour. It renders the timber proof against the attacks both of the worm and the moth. This cedar resin, which is sometimes called *cedrin*, flows spontaneously from the trunk upon incision. It somewhat resembles mastic, and was often used by the ancients, along with other aromatic gums and resins, in the embalming of the dead. It was burnt as a perfume at the funeral pyre; it was also used in certain diseases as a medicine.

It is proper to mention, however, that Pliny, to whom we are indebted for these facts, comprehends under this name the lesser cedar (*oxycedrus*), or Phœnician juniper, which is still common on Lebanon, and the resin of which is also aromatic. Cedar oil, a kind of turpentine, was likewise prepared from the wood, and was applied to the rolls of papyrus in order to preserve them. Hence the celebrated sentence attributed to Persius, that in order to deserve fame one should leave words which were worthy of being preserved in cedar! The resin or oil of cedar are almost unknown in the present day. We wish it were otherwise; for in that case we might present a striking contrast to some (most, indeed) of the modern chemical processes of the destructive distillation of resin. The essential oil of cedar, we may add, belongs to a family of hydro carbons which are all celebrated for their antiseptic properties. The oil of juniper, the oil of cloves, the oil of nutmeg, and some others, belong to the same family,—of which, however, the most perfect chemical type is the essential oil of bitter almonds.

The next important purpose to which the timber of cedar is applied must come under the wide category of interior decoration. But to whatever extent it may have been applied in this direction in eastern countries, it cannot be said to have taken root in Europe. For wainscot or panelling it cannot be compared for a single moment with oak, or even in certain respects with red pine. The fact is, being a very porous wood, it is liable to absorb moisture, and so become extremely sensible to changes of temperature; in other words, to split and crack. Although it is very easily cut, it does not preserve its form when cut; and besides, we are half of Mr. Ruskin's opinion, that carving in cedar is too easy to be valuable. Some of the American river steamers, we are informed, have their large and handsome saloons fitted up with cedar, carved and heavily gilded; but even here it cannot compete with mahogany. Certain Mediæval Greek churches, as we learn from the ecclesiastical historians, had their rood screens, and sometimes their altars, constructed of this material; but it was seldom or never employed for the sedilia or other internal fittings. The best example we remember to have heard of with regard to the application of cedar to interior decoration, was a very handsome library, fitted up in the Cinque-cento style by the late King of Bavaria; but whether the material was derived from Lebanon or from South America we do not at this moment recollect. No doubt but for this purpose cedar is a highly useful and proper material. Book-shelves constructed of cedar would have the very same conservative influence on books that Russian leather binding exercises, and their common effect springs from the same cause—in each case the antiseptic properties of the oil. Besides, as we have seen, there is the antiquity of the practice to recommend it. If the ancients kept their writings in cabinets of cedar, why should we moderns not follow their example with regard to our books?

We must not overlook entirely, in our cursory survey of the subject, the tablets of cedar mentioned by Vitruvius. These consisted of wax tabulæ, that were written upon with a stylus, and which were furnished with timber backs and raised mouldings on the front edge, either composed of citron or of cedar. The wood tablet used by the prophet Isaiah (iii. 22) signifies perfume boxes. In Hebrew it is literally "Houses of the soul or breath." Many Eastern women still wear an ornament composed of cedar, resembling a house or temple, containing a small image, obviously at once a symbol of purity and of devotion.

If we wished to institute a comparison derogatory to our modern sentiment, we must refer to the very popular application of cedar to the manufacture of cigar-boxes. The boxes in which Havannah cigars are usually imported consist, however, of a very common tree, a native of the West Indies, known in the trade as Barbadoes cedar. It reaches often to the height of 80 ft., and its trunk is remarkable for its circumference. The cones, bark, and leaves have a bad smell, resembling that of assafœtida; but the wood has a rather agreeable fragrance. Enormous quantities of the timber are annually consumed in the form of cigar-boxes and light packing-cases, and it is sometimes used in France and Germany in making the cheaper sorts of blacklead-pencils. This tree (*Cedrus odorata*) is so common and plentiful in the West Indies that it is used for the most ordinary domestic purposes, such as shingles; and it has been even applied by the natives to the construction of their canoes.

The next and probably the most important modern application of cedar we shall notice is that of furniture. And here the same principles, of which we have already spoken, will govern the extent of its consumption. It will not make a good chair; but it will make an excellent work-box or dressing-case. It could never, we think, supersede mahogany as a table or a sideboard; but it will make a splendid wardrobe and the best of all book-cases. It must always be remembered that the value of cedar resides in its virtue of resistance to the parasites which infest other timber, its general antiseptic properties, its pleasant odour, and its light agreeable tone of colour. We understand that Messrs. Morrison, of Edinburgh, under the direction of Lord Lindsay, have ingeniously contrived a description of wardrobes in which the best features of mahogany, rosewood, or walnut are combined with an interior skeleton of Florida cedar, thus uniting the properties of both woods in the same article of furniture, and we can easily imagine that the conception is a sound one. The lining of wardrobes and drawers with cedar, however, is of old date in Scotland. As a material for furniture, *per se*, Florida cedar is by no means the best. That which is imported from the Northern States, although possessing less perfume, is harder, more susceptible of polish, and capable of standing greater tear and wear. This species of timber is also the best adapted for the cases of pianofortes, although we cannot admit that cedar is the best, or even one of the best, forms of timber for this trying purpose. Some of the finest specimens of cedar that can be applied to furniture or such like purposes may be seen in the museum at Kew Gardens; and we may add that we saw in the Paris Exhibition several highly creditable examples of light cedar bedroom furniture, for which purposes we think it will be found highly suitable.* Its chief consumption at this moment, however, consists in the lining and interior fittings of drawers, wardrobes, sideboards, and tables; in which respect it is, owing to its low price and abundance, gradually superseding oak and even black birch. As we have said, it will never stand comparison by itself with mahogany or black oak for dining-room furniture, or with rosewood or walnut in that of the drawing-room. But in the library and the bedroom there are grounds for believing that cedar furniture will gradually obtain a principal place.

The last and certainly not the least important application of cedar is that of its use in the manufacture of black-lead pencils.

On this head we shall be brief. Some years ago, we described at great length the whole process of the pencil manufacture in Cumberland; and to that volume we must refer the reader who cares to pursue the subject minutely. We shall just state here that its adaptation to pencils is threefold. First, its freedom of manufacture; secondly, its pleasant perfume; and lastly, its property of easy cutting along with the lead. Keswick pencils are mostly the produce of Florida cedar; and the kind which is best suited for the purpose is the free, quick-grown wood; there is a harder sort of slower growth, which, however, is more fitted for the purposes of furniture. Those who are in the habit of cutting good pencils will know better than we can describe the feelings of impatience and disgust which one cannot avoid on coming across a piece of hard cedar in the pencil-stick! The red

* See Mrs. Jameson's "Illustrations of Sacred Art," p. 128.

† Ezra, iii. 7; 1 Esdras, iv. 48, 55.

‡ *Vide* Williams's "Holy City," ii. 202, and other authorities cited by Dr. Smith, "Dictionary of the Bible," art. "Cedar."

§ See his excellent and exhaustive article on the subject in Kitto's "Bible Dictionary," edited by Dr. Lindsey Alexander. Vol. i.

‖ See Tredgold's "Principles," under "Cedar" for other Applications.

¶ Hist. Nat., b. v.

* Vitruv., lib. ii., 9. In the time of Vitruvius the timber (*cedrus*) was principally obtained from Crete, Africa, and *some parts of Syria*.

* Since this article was in type, Sir Wm. Maxwell Stirling tells us that his library at Keir is *lined* and *shelved* with planks of cedar.

cedar, so well known in the pencil trade some five-and-twenty years ago, was chiefly derived from the Virginian cedar, which is in fact a juniper (*Juniperus Virginina*). Like the cedar, these junipers are distinguished for their resinous qualities, and have been also applied to furniture and other purposes; but its chief consumption was in pencils.

We began this article with a description of the cedars of Lebanon, and we conclude by once more expressing the hope that these splendid historical trees will not be allowed to become extinct. Here, after all, resides the poetry of the subject. There are other woods, such as Spanish mahogany and walnut, which are more beautiful in their colour. There are some, too, such as rosewood and sandalwood, which are possessed of a stronger fragrance and a more agreeable perfume. But no other tree carries back our associations to the time when Solomon, in all his glory, ruled the destinies of Israel; and no other was thought fit to be applied to the sacred purposes of the Temple altar and the covering of the cherubim.

LETTERS BY SIR THOMAS LAWRENCE.

THE following hitherto unpublished letters addressed by Sir Thomas Lawrence to Mr. Penry Williams will interest many of our readers, not merely by their references to men and incidents, but by the advice and criticism they include :—

"Russell-square, August 31, 1867.

DEAR SIR,—You have not been absent from my thoughts, although my too numerous engagements and professional labours have prevented my sooner writing to you. I received with the greatest pleasure the little sketches* that you sent to me by my friend, Mr. Camuccini, which are touched with your usual taste, delicacy, and truth. They will be always retained by me, as evidence equally of your talents and of your thoughtful remembrance of me. I shall most sincerely rejoice to hear of your continued health and the successful prosecution of your studies.

You inform me that you have been making sketches of the peasantry—their costumes, &c., &c. You are right in keeping up this attention to the human figure, since it will not only be of great advantage in the introduction of it in your landscapes, but, from the increased difficulty of its study, it will exceedingly enlarge your power of copying inanimate nature. The best historical painters have always been painters of good landscape; and perhaps there are examples in Titian of a greater style in that department of art than can be found in Nicolo or Gasper. I would add Claude, but that he is so exclusively devoted to the beautiful (or to that species of grandeur that is united to it) as not properly to have place in the comparison. The chief direction of your studies, however, will be landscape; and I have no fear of your interpreting my advice into abandonment of it for any other.

I am now about to ask you to employ your genius on it for me, and on such a scale as your Windcliff drawing. If the evenings are still of the same beautiful serenity that I remember, will you give one of their happiest effects to a general view from the front terrace of San Pietro, in Montorio? I used often to drive up there for the delighted admiration which the grand expansion of that scenery so constantly excited. It reminded me of Milton's fine description of Rome in the 'Paradise Regained.' A faithful delineation of that scene, touched with your usual finishing and pure taste, would be much valued by me, and, I need not say, possessed by me for your own price. Do not, however, let me fetter you by this commission, nor, above all, break in on the rational happiness of your stay at Rome. Be free as air in your choice of subject, so that you employ your talent, and do not lose this spring-time of your life, which, from your present residence, will hereafter appear its happiest epoch.

I am rejoiced to learn that you have for your companion young Mr. Theed: he left England with great promise, and a regard has followed him from the esteem and respect in which his father was held by us. Give my kind remembrance to him.

You will probably have been introduced to Mr. Eastlake, whose admirable picture† was so justly admired in our late Exhibition. Pray offer him the inquiries of my high esteem and regard, and cultivate as much as you can (without intrusive freedom) his advice and friendship. To my friend, Mr. Pietro Camuccini, I beg you will not fail to offer my best thanks for his kind friendly letter. I do not want you to tell him that I consider him as one of the most amiable and estimable men that I have ever known, but I privately tell it to you for your guidance and advantage, as I know you can safely trust to his judgment, and have perfect confidence in his worth, whatever be the subject of your application to him.

Pray, if you have time to write again, inform me if Mr. Metz is still living and in health.

Believe me always, dear Sir,
Your very faithful servant,
THOS. LAWRENCE."

"Russell-square, March 9, 1829.

MY DEAR SIR,—I have received and read your welcome letter with great pleasure, and shall carefully attend to your wishes respecting the exhibition of the picture you are sending for Mr. Bailey, and the having it properly framed; the drawings I shall give to Mr. Robson, should anything prevent your sisters calling for them.

I trust I need not tell you how sincerely I rejoice in your success, and in the good taste and liberality of my countrymen; but, hitherto, you have 'won your own spurs by your own valour,' however the kindness of friendship may have cheered you in the contest. Think no explanation to me necessary for change in your choice of subject, provided it be advance in character; for the painting of your figures last year convinced of your increasing ability in the study of the human figure, and, unless you attempt the higher dramatic or epic style of composition, you already walk in perfect safety, and need fear no pit-fall in your path. I am anxious to see the picture you are now sending, of which I heard last night a very favourable opinion from Mr. Turner.

You give me sincere pleasure in still considering Mr. Bailey as your first friend, in your own selection of the purchasers of your pictures. Neither can it be undelightful to you to send down the best efforts of a genius that is now generally acknowledged, to that private and humbler scene where it was first nurtured and advanced. There were many competitors for your little picture of the 'Youthful Italian Lovers;' but having your own authority for considering it to be Mr. Bailey's, I carefully retained it for him. Beautiful as your drawing of the same subject was, I preferred the picture.

I am well acquainted with the talents and intelligence of Mr. Havell, from my own knowledge of his works and the report of his friends. Your tour to Naples must have been rendered both pleasanter and more improving by such companionship. If, indeed, you now go to complete those sketches which were but slightly traced with him, and add to them the colour and effects of Nature, your tour with a man of such known taste and knowledge of composition, whether beautiful or grand, will have been all gain, and the benefit be lasting.

You inform me that you have not forgotten my own commission, which I took the liberty to offer you, of a drawing of Rome from San Pietro in Montorio. You will oblige me much by executing it for me. Your powers are now in their youthful vigour, and there is a truth, delicacy, and refinement in your drawings that, except in our greatest artist, I have seen in no other. From my own recollection, a sun-set or evening is the finest moment for that glorious scene.

You have so many commissions of importance that I hardly venture to press others on you. There is a gentleman, however, who is desirous of having two small pictures by you, about the size of the "Boy and Girl," at your own price and subject. He is not in the circles of fashion, but known to almost all our artists by his liberal patronage and gentlemanly conduct,—his name is Vernon. Let me know that you undertake them for him.

I shall not fail to give your remembrance, with your thanks, to Mr. Callcot, who will be much gratified by the report of your success. You are fortunate in having still the society of Mr. Eastlake, an advantage that cannot be too highly appreciated. I am much pleased with your account of Mr. Uwins. He very greatly obliged me by sending me some interesting sketches from Urbino, that birthplace of the prince of painters; they are drawn with a Raffaellesque simplicity and taste. I shall have to write to you again in a day or two, on the receipt of your picture.

In the meantime believe me to remain, with my best regards to Mr. Pietro Cammuccini (which I particularly beg you to communicate),

My dear Sir,
Your very faithful friend,
THOS. LAWRENCE."

"Russell-square, March 27, 1829.

MY DEAR SIR,—I have the pleasure to tell you that your picture and the drawings are safely arrived; I have ordered a frame for the former, and the latter are now either with Mr. Robson, or gone from him to your sister.

Your drawings will doubtless be much admired, but I prefer your picture, which I think very beautiful; you have rendered an incident in nature,—a peasant woman suckling her child (which, though it ought always to be hallowed, is yet sometimes unpleasing in itself, and often grossly represented),—with a delicacy and affection that make it deeply interesting and pathetic; and you have likewise given that essential in such subjects—beauty. The composition and colour of the picture are exceedingly good, and altogether make it a decided advance on your popular little picture of last year.

I have little to add of other criticism, except to notice a trifle of defect. You have taken great pains with your principal figure, and the eyes are as well drawn as the other features of her sweet countenance; but in the two boys, the one on the ass, and the other accosting him, the eyes are two dark blots, and ill-formed. Let this carelessness be soon impossible to you. Besides the incorrectness, it is a check to the interest of the work, or the incident, however trifling, when there is meant to be communication between the figures.

In that sweet little work, too, of last year, the boy was not looking quite in the girl's face. Be at the pains often to draw that feature. I can quote you high authority for it; I have a sheet of eyes drawn by Michelangelo for some young Penry Williams, whose genius had excited the friendly effort.

The fault equally exists in one of your drawings,—in the child just beginning to walk; and there, by-the-by, you have a little failed, for the child is not pretty, nor have the features the delicate form of infantile character.

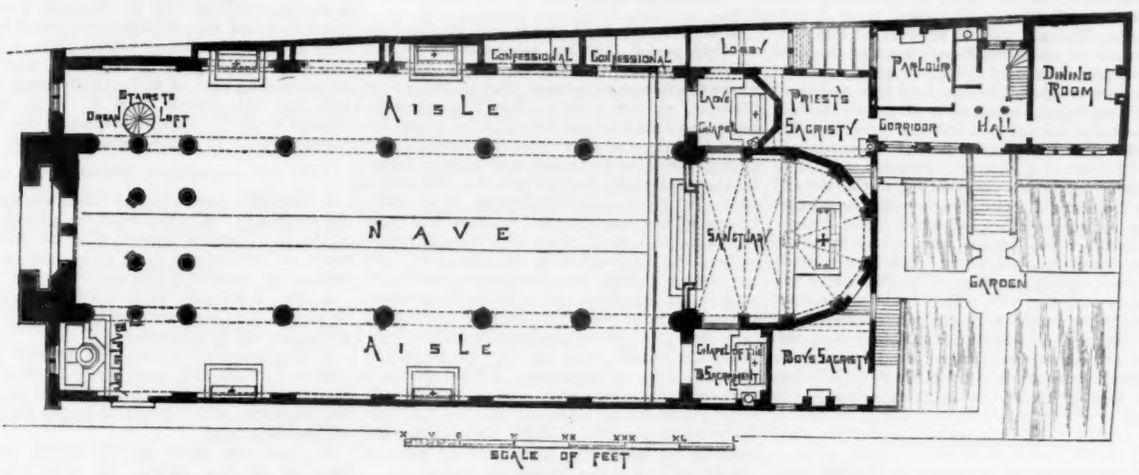
Try now to get something of more precious character of surface in your skies and distance. Don't be content with insipid, fair, Roman painting (this between ourselves); Claude's, 'tis true, are all softness, but we have been too long accustomed to see them touched with the expression of the pencil to be content with their tame and spiritless representations. 'Tis the same with your distances; they are very accurate, of true and sweet hues, but you do not scumble enough, nor give that finer zest of pencilling that is so exquisite in the first works of Claude and Turner. One thing I see is very much against you, viz., the coarseness of your canvas, which no quantity of colour could well subdue.

Your sister has just sent me your letter with the description of the picture, which I shall direct to be inserted in the catalogue. I have not yet written to Mr. Bailey. This picture, I am to understand, is his; but pray tell me what would be your price for another of the same sort of subject and size? I mean your general price to any visitor of your study. I am now going to ask a trifling attention from you which may not be without its use. Never write a letter home without adding to its date the place of your residence at Rome. Letters are mislaid, your friends may be old, and their memory of the numbers and names of streets be rapidly decaying; whereas, if one only of the former is preserved, the direction is found which some intended patron may be soliciting at that moment, or which may be wanting to the direction of some letter. The Duke of Wellington never writes a note but with scrupulous attention to this little form. Besides, the habit of doing one thing leads to application of it in another, and the peculiar danger to which talent and genius are exposed, is irregular desultory thought and neglect of method—of that love of order which is essential to respectability and happiness. I fear you will think my letter and lecture too long, but their extension springs from sincere regard, and an esteem that will always leave me, my dear sir,

Your faithful servant,
THOS. LAWRENCE."

*Two small drawings done in a letter, views of Claude's house and Raffaelle's villa at Rome.

† Greek subject of Spartan youth.



ST. MARY'S NEW (R.C.) CHURCH, KENSINGTON.—*Plan of Church and of Residence adjoining.*

[See p. 511.

ST. MARY'S NEW (R.C.) CHURCH, KENSINGTON, MIDDLESEX.

WE illustrate this week the new Catholic Church of St. Mary, which is being erected on a site adjoining Newland-terrace, in the High-street, Kensington, from the designs of Messrs. Goldie & Child, architects.

The style of the new church is that of the earlier part of the thirteenth century, with the introduction of Geometrical tracery in the apse and principal façade. This will face the high road, and will comprise a great central doorway under a moulded and carved arch spanning the deep recess formed by the projection of the buttresses, and carried by polished granite shafts with moulded bases and foliated capitals, the whole being surmounted by a light arcade forming a parapet, and bearing effigies of the Virgin Mary carrying the Saviour, with attendant angels on either side, and above this will rise the window lighting the nave, and composed of six lights, with a rose of as many lights, cusped, in the head. The gable will contain a triple-lancet window, above which, at the apex, will rise a cross of suitable design.

The aisles are lighted from the principal façade, by two-light windows, having a rose in the head of each, while the apices of the buttresses are crowned with carved statues of angels.

The central portal will display a broad arch of foliage carved on marble shafts, enriched with encaustic tiles and inlays with a moulded base and foliated cornice. The entrance is divided into two, by a central shaft carrying the lintel, the ends of which rest on foliated corbels springing from the jambs. The tympanum will contain a large seated effigy of our Lord in majesty, attended by adoring angels, the intervening spaces being filled in with foliage, which will be, throughout the church, of the severe conventional type, consistent with the style.

Entering the church, the dimensions will be striking. The entire length will measure 143 ft., of which 33 ft. will be devoted to the choir and sanctuary. The width of the nave will be 30 ft., and the total width of nave and aisles 58 ft. The internal height of the nave will be 65 ft. The nave will be separated from the aisles by a lofty arcade of six bays, carried on cylindrical shafts of polished granite, already fixed, with moulded bases and bands and foliated capitals. Above this runs an arcade, carried by shafts of terra-cotta, with moulded caps and bases, stopping between the pilasters which carry the deeply-recessed clearstory arcade, which is lighted by single lancet windows. The aisles will be lighted by cinque-foiled rose-windows, and have recesses of confessionals and side altars.

The sanctuary will be raised 4 ft. above the nave, and will be reached by six steps leading to the choir, and two more into the sacrarium. This portion of the church will be divided from the nave by a moulded arch, springing from foliated and moulded corbels, and will consist of nine bays, whereof seven will form the apse, all lighted by two-light windows, having a seven-lobed circle in the head of each.

The roof of the nave will be a continuous barrel vault of timber, with a moulded king-post and tie-beam to each principal. The sanctuary and two lateral chapels will be groined, and the organ will be placed in a gallery at the western end of the church, carried on six granite shafts, banded, and with moulded caps and foliated caps. At the entrance to the sanctuary will rise, on the exterior, a lofty *flèche*, covered with lead, and bearing on its apex a rich vane and cross, at a height of 120 ft. from the ground. At the rear of the church will be a residence for the clergy, suitable in style and arrangements to the rest of the edifice, and communicating with the sacristies behind the high altar. The foundations, which are very extensive, have been executed by Mr. Simpson, builder, of Tottenham-court-road. The foundation-stone, bearing a suitable inscription and containing the usual deposit, was laid with ceremony on the 14th of May last.

ON LINCOLN CATHEDRAL.*

FOR those who desire to study the progress of style through the Lancet period, Lincoln Cathedral presents the amplest opportunities. We can trace the hand of the designer of Bishop Hugh's works, in continuation of that of the choir, along the east walls of the great transepts, as well in those of the east aisles as in the upper parts of the building; we can trace even the gradual slackening of the work, and its absolute cessation in the north and south walls of these transepts. Here a pause of many years must have occurred, probably whilst the crossing and central tower were rising, which, however, fell from insufficiency of some kind, *per insolentiam artificia*, in the year 1239. Meanwhile Bishop Hugh, having been canonized, became the patron saint of Lincoln; the odour of sanctity attached to his memory attracted crowds of the faithful to the cathedral, and the contributions, which flowed in largely, permitted the rapid prosecution of the works, which, judging from internal evidence alone, must have been resumed about 1215, and carried out without intermission in the course of the next twenty years. These later works of the Lancet period comprise, — 1. The central transept (west side). 2. Nave and aisles, with north and south chapels. 3. West front, with north and south pinnacled turrets. 4. Chapter-house. 5. West porch of south transept. 6. The crossing and lower part of the central tower (rebuilt); and, 7. The two western doorways of the choir aisles. They were constructed probably in the order above given, and show, with the exception of the two last-named, but slight differences of style in their details.

With regard to the Chapter-house there exists a singular discrepancy between the internal evidence afforded by the character of its work and the external evidence of documentary history. We are told by Giraldus Cambrensis, on the authority of Wharton, that Bishop Hugh built the "Capitulum," a term which can only correctly be interpreted "chapter-house." Professor Willis, feeling convinced that the work was of later date, endeavoured to explain away the difficulty by arguing that the word "*capitulum*" meant, in this case, "*caput ecclesiæ*," the head, or east end of the church.

It is always unfortunate when, as is sometimes the case, antagonism arises between the internal evidence furnished by the building itself, and the external evidence of contemporaneous history. In the earlier days of archæological study the tendency was to discredit the former and to accept the latter; in these days the results of strict analytical investigation and comparison of the minor details of the buildings of the Middle Ages dispose us to place much more reliance upon this species of internal evidence than on even the most unequivocal assertions of ecclesiastical historians. The inductive reasoning based on the former appears to be safer than the possibly hearsay testimony of the latter.

Without, then, contending for, or, indeed, accepting, Professor Willis's interpretation of the word "*capitulum*," as used by Giraldus Cambrensis, I have no hesitation in asserting that the stonemasons who executed the work of the Chapter-house of Lincoln Cathedral did not live in Bishop Hugh's time, but twenty or thirty years later.*

The two latest of this second group of Lancet works, namely, the west porch of the south transept, or Galilee porch, as it is usually called, and the two doorways situated at the west end of the choir aisles, exhibit much greater elegance of treatment and delicacy of execution than the others. Of these two works, the former may be advantageously compared with a similar work, similarly named, at the west end of Ely Cathedral, which belongs to the earlier, as this porch does to the latest part of the Lancet period; whilst the exquisite carved work and capitals of the former correspond closely with those of the elegant work of contemporaneous date at the east end of the choir of the same cathedral, which was commenced by Bishop Northwold in 1235.

Before quitting the work of the Lancet period, it may be well to notice an opinion which has prevailed, and which is due, I believe, to Professor Willis, who discovered that the name of Bishop Hugh's architect was Geoffrey de Noiers,

* By Mr. Edmund Sharpe. See p. 484, *ante*.

* In a paper which was read at Lincoln by the Rev. J. Dymock, on "The Documentary History of Lincoln Cathedral," the day following that on which Mr. Sharpe's lecture was delivered, the difficulty above referred to was completely solved by the fact announced by Mr. Dymock, that, on reference to the original text of Giraldus Cambrensis, he had discovered that the passage in question had been erroneously transcribed and printed by Wharton, the real word in the MS. being plainly and legibly written, not "*capitulum*," but "*capitium*," which cannot otherwise be interpreted than as signifying the head or east end of the church.

to the effect that the design of the east transept and choir of Lincoln Cathedral is of French origin. The only feature, however, in this work which at all resembles French work of this date is the pier capital of the choir, which, with its double row of stiff foliage, and four attendant shaft capitals, all attached to the same block, is not unlike those of Chartres and Soissons. But we have in the pier capitals of the presbytery of Chichester Cathedral, designed and constructed only a few years earlier, at the close of the Transitional period, the very idea, in genuine English workmanship, of which these Lincoln capitals are the Lancet version, and to which, with their detached shafts, they bear a much stronger resemblance than to the capitals of any French cathedral with which I am acquainted. In all other respects, in the general outline of the design, and in all its minor details of mouldings and carved work, there is no resemblance whatever between the work of Geoffrey de Noiers and that of French buildings of corresponding date.

Geometrical Period.

The introduction of Tracery in the middle of the thirteenth century caused a rapid and complete change in the appearance of buildings: it arose from the practice of perforating in various ways the spandrels of arches, and the solid stonework lying between the heads of contiguous lancet windows. Of this practice, and its progress through the Lancet period, we have excellent examples in Lincoln Cathedral. In the plain circles, trefoils, and quatrefoils, with which the solid stonework above the sub-arches of the blind story of the choir and early transept of Bishop Hugh is perforated, we see an early and a somewhat clumsy effort to relieve this blank space. In the nave three foiled openings more completely occupy it; and in the noble wheel-window of the north transept, so entirely is the large plate of stonework, which fills the circle, pierced, that but small portions of solid stone remain between the circular voids.

To call this a traceried window, however, would be a mistake: the principle of tracery, which consists in the conversion of the whole of these intervening portions of stonework into moulded bars, is wanting. This is the invention, then, which, applied in circular forms to the windows of the succeeding period, forms its chief characteristic.

1. Of the noble series of monumental works which were constructed in England during the Geometrical period, one of the earliest, and certainly one of the finest, is the presbytery of Lincoln Cathedral. Designed, as we know it to have been, about the year 1256, at the exact moment when Gothic architecture in its chief forms, its sculpture, its carved and moulded work, had reached its highest development, it exhibits in every part a refinement and elegance, as well as a delicacy of finish in its minutest details, to which it would be difficult to find a parallel in the whole range of Gothic art. To attempt to describe to you its varied beauties in the short space of time at our disposal, would be a vain effort.

I cannot, however, pass over without notice its chief and most characteristic feature, its glorious east window of eight lights, confessedly the finest of its kind in the kingdom, which, occupying as it does the entire east end on the inside, and worked out as it is with a wealth of deeply-moulded detail of surpassing excellence, may be looked upon as the crowning work of the singularly beautiful building of which it forms the termination, and the chief ornament.

This building, commenced, as it is reasonable to suppose, immediately after the granting of the Royal permission to remove the city wall, in order to allow its construction in 1256, was so far finished in 1282, that Bishop Hugh's shrine was transferred into it in that year.

Among the remaining works of the Geometrical period may be noticed,—

2. The stone screens of the choir on the east, north, and south sides. They were probably all commenced soon after the completion of the presbytery. One of them, on the north side, has on its aisle front an arcade of circular foliated tracery so exactly similar to that of the aisle arcade of the nave of York Minster, and is finished with straight canopies carrying mouldings, crockets, and finials so identically the same, that it is scarcely possible to suppose that they were not designed by the same hand.

3. An Easter sepulchre on the north side of the choir, with figures and carved work of great excellence, belongs also to this later Geometrical work.

4. It was not until the middle of the Geometrical period that the stone-carvers of the Middle Ages began first to imitate in their works the foliage of nature. The period is thus divisible, almost equally, into two portions, Early and Late; during the earlier of which the carved work was of *conventional* design, and during the later in imitation of *natural* forms. In the presbytery the capitals, not only of the piers, but of all the host of minor shafts, carry foliage of the most elegant conventional type, consisting of curled leaves of the most varied outline, but all designed in the same spirit. In the passage leading from the north-eastern transept to the cloisters, and in the cloisters themselves, we have an opportunity of contrasting the new fashion of carving, introduced about the years 1280—1290, with the old; the capitals of all the shafts, of the tracery of these two later Geometrical works, having natural foliage only, chiefly in imitation of the oak and the vine leaf. So much as remains of this cloister is in other respects an interesting example of the works of the second half of the Geometrical period.

5. Whether the central tower, of which the two lower stories remain, was ever carried higher, we have no record, and no present means of knowing: what is certain is, that its noble upper story, belonging to the latter part of the Geometrical period, must have been commenced about the year 1306. It is justly reckoned one of the finest central towers in the kingdom, and groups as grandly with the two smaller western towers as the central spire of Lichfield Cathedral does with the two subordinate western spires of that building.

Curvilinear Period.

1. Whether or not all may be disposed to agree that the progress of art from the point at which we have now arrived was in a downward direction, and that the decay into which church architecture fell, at the close of the Rectilinear period, dates, in its earliest beginnings, from the time when natural foliage was introduced into the ornamentation of buildings, and flowing tracery into their windows, it cannot be denied that, in one respect, the builders of the two latest periods surpassed their predecessors. The graceful finish of the upper walls and gables of by far the greater part of our cathedral and parish churches, of whatever date, is due to the panelled and pierced parapets, and crocketed pinnacles of the Curvilinear and Rectilinear periods. Of this we have notable examples at Lincoln; the earliest of which occurs in the panelled parapet of the west front, which crowns so appropriately the earlier work below. To the same date belongs the flowing pierced parapet of the south clearstory of the nave, with its Curvilinear pinnacles marking the limits of each compartment. Following this parapet westwards we arrive at the west wall of the south transept, along which this open parapet of flowing tracery is still continued.

2. The chief work of this period, however, was the remodelling of the south front of the south transept. This work consists of a large circular window, corresponding with the rose window of the north transept, and filled with flowing tracery of Flamboyant character, of a large five-light window above, and of a pierced parapet of flowing tracery on the gable.

3. It is not improbable that this work is due to the Burghersh family, one of whose members was Bishop of Lincoln from 1320 to 1340, during the time, in fact, that it must have been executed. This supposition is confirmed by the circumstance that a chantry belonging to this family was founded at the east end of the north aisle of the presbytery, one side of which was formed of the tombs of Lord Burghersh, the founder, who died in 1356, and of his brother, the bishop, who died in 1340. They are both interesting monuments.

4. The last works of this period were the two canopied tombs at the east end of the presbytery, under the last pier-arch on the south side. They are, although late, of very elegant workmanship, and were probably erected during the lifetime of Lord Cantilupe, by whom the adjoining chantry is said to have been founded, but who did not die until 1372.

One of the most elaborate and admirable screens of any kind that exist, designed in this style, is to be seen in this cathedral under the east arch of the crossing, and serves at present as the organ screen. It is stated by Wild to have been constructed in the year 1775; but it is scarcely credible that so excellent a work is due to a period when Gothic architecture was so little understood and appreciated. It is probable that it is a very careful and accurate restoration of an existing work of undoubtedly great merit, and that the greater part of what we see belongs really to the earlier part of the Curvilinear period. It deserves attentive study.

Rectilinear Period.

1. Strongly resembling the Cantilupe tomb, is the arcading of the interior of the ground story of the two western towers, with its elaborate vaulting; and to the same early date probably belongs the interior of the west doorway.

2. The upper part of the west towers was, no doubt, the next work executed. They are plain, but well proportioned.

3. The insertion of the west window of the nave and north and south aisles followed; and the construction of the canopied work, above the west doorway, with its row of kingly statues, is of the same date.

4. The west porch of the south transept received in this period its richly-panelled parapet; and the airy lightness of the sky-outline of the central tower is due to its pierced Rectilinear parapet, constructed probably about the same time.

5. The three last works remaining to be described belong all to the latter part of this period. They are the chantry chapels of Bishop Fleming, who died A.D. 1432; of Bishop Russell, who died A.D. 1480; and of Bishop Longland, who died A.D. 1521. The two last named are excellent examples of this kind of sepulchral oratories, which were often erected by the prelates themselves during their lifetime.

In the transepts are several screens of excellent Rectilinear design; and the stall-work of the choir, executed in the early part of the period, is amongst the best in the kingdom.

PARIS.

IN the interior of the new Opera-house the works of decoration advance slowly but steadily, and it will be many months before they assume a comprehensible form. The iron ribs of the dome are in place: it will have a very flat and *enfoncé* appearance, especially as the base from which it rises, though apparently of some consequence as seen in the elevation, cannot be perceived except from afar. The ornamentation of this base cannot, tasteful as it may be, appear at a great distance; and, as all cats are grey in the dark, so all details of ornamentation, good or bad, are equal in artistic merit when viewed from afar. The term *dome* is a misnomer here, as, in all cases, this feature should *dominate* over the rest of the building, whereas in this building it is completely masked, from the north side, by the roof. It is a pity, also, that the site on which the new opera stands cannot permit of its being at all seen from the line of the Rue de la Paix and the Place Vendôme. The clearance for the new Place de l'Opéra and the new street from the Palais Royal to lead to it has been undertaken on a scale which is truly appalling. Looking at this vast plain of *débris*, from the Opera-house, one would imagine that Baron "House-manie" intended to demolish every thing between the "noble" building and the river. The new street, it is said, is to be the most magnificent in Europe, and of course in the world, and a profitable speculation for the Ville de Paris, &c. The façade of the Opera is not yet completely uncovered; the same hoarding that we saw last year is still in its place, with this improvement, that it has been decorated with a coat of slate-coloured paint, and the unsightly placards and street bills have been removed totally.

At the corner of the Rue de la Chaussée d'Antin the new Théâtre du Vaudeville is in a forward state, and the planked hoarding, which sheathes it from top to bottom, is disappearing piece by piece, and the cupola of the auditorium is terminated, as are also the floors of the first four galleries.

From a return sent by the municipal authorities of Paris to the Commission of the Budget, it appears that since 1853 the population of the town has doubled; but they forget to say that the area of Paris at that epoch was only 3,222 hectares (hectare equal to about 2½ acres), whereas since the annexation of the new eight arrondissements the area is 7,802 hectares. The number

of houses demolished during the last fifteen years is put down at 20,000, and the new houses built 45,000. The 25,000, representing the surplus of the construction over the demolition, give a surplus of 110,000 apartments, and it is estimated by the authorities that there exist in Paris 80,000 lodgings, the rents of which are less than 500f. (20*l.*) per annum.

Seven bridges are now in construction over the Seine below Paris; two below the park of Neuilly, three below Clichy, across the two Isles des Ravageurs, and two below Saint Ouen. These will permit the Parisians to locate themselves on the verdant hills of the *rive gauche*, from Courbevoie to Genevillers.

The Ambassador of Russia has forwarded to the Prefect of the Seine a marble bust of the Emperor of Russia, presented by him as a *souvenir* of the *soirée* he passed at the Hôtel de Ville, June 8th, 1867. It has been placed in the gallery of sovereigns, containing the busts of those who since 1853 have honoured the Hôtel de Ville with their presence. There are twelve already there: those of the Queen of England, Prince Albert, Victor Emmanuel, the late Dom Pedro of Portugal, Dom Luis I. of Portugal, the Queen of Portugal, the late King Maximilian of Bavaria, the Sultan, the Emperor of Austria, the King of Prussia, the King of the Belgians, and the Queen of the Belgians.

Notwithstanding the protest made to the Prefect of the Seine, signed by 2,500 inhabitants of the arrondissements of the town of Sens against diverting *their river*, the Vanne, for the purpose of supplying Paris with more water, the reservoirs of Montrouge were commenced on the 29th ult. This colossal structure, placed between Montsouris Park and the riding-school, is bounded on the south by the Avenue Reille, on the east by the Avenue de Montsouris, on the west by the Rue de la Tombe Issoire, and on the north, at some distance, by the Boulevard du Transit. It will be of two stories high, built entirely out of the ground, and will contain 305 millions of litres (123 for the higher quarters of the left bank, and 182 for the low quarters of the left and part of the right bank). It has been decided that the Palace of the Bardo (Bey of Tunis), as yet standing on the Champ de Mars, shall be re-erected at the Montsouris Park. All the materials purchased by the administration are to be made use of, and the present rubble basement replaced by one of ashlar.

We mentioned some time ago that the Bièvre river was to be diverted into the collecting sewer of the left bank, and to cross the Seine by a gigantic iron syphon-tube, near the Pont de l'Alma. This is being carried out, and the immense pieces of tube may be seen on the banks of the river. The barge carrying the dredging apparatus and the immense diving-bell is moored close to the left bank, and the workmen go down by relays and work at their ease, as the depth is not very great. Only one of the arches of the bridge is at present available for navigation.

THE SANITARY STATE OF BARRACKS.

FOLLOWING up what we did some years ago, the *Lancet* has sent sanitary commissioners to examine several of the metropolitan barracks and that at Windsor. The barracks of the Household Cavalry at Knightsbridge they condemn as unfit for either officers, men, or horses. The whole place is redolent of horses and horse-manure, the buildings being huddled together, and the litter thrown out directly under the windows of the barrack-rooms. The mess-rooms of the privates have been taken from them for regimental offices, and they are now compelled to take their meals in their bed-rooms. The married men and their children are lodged in the most shameful manner. They have no supply of water, no water-closet, no domestic conveniences whatever. They are worse off than they would be in a workhouse or a prison. The managers of the Zoological Gardens would be execrated if they kept their animals in such an unhappy state. There appears to be an almost total neglect of sanitary laws: bad ventilation, offensive urinals, disgusting privies, untrapped drains, and badly ventilated barrack-rooms. In the hospital the bath for the 6 ft. troopers is 4 ft. 2 in. long! Extraordinary pains appear to have been taken to secure ventilation and pure air by complicated tubes over the gas-burners, louvre openings near the ceilings, Sheringham valves and Galton stoves, to the utter neglect of the simpler, but far more efficient, expedient of making a sufficient number of windows opening at the top. The Commissioners recommend that this barrack should be at once rebuilt.

Great fault is found with the situation, arrangement, construction, and ventilation of the barrack-rooms to the Regent's Park Barracks, which have neither lavatories, urinals, nor latrines close at hand. The troopers eat, drink, and sleep in the same rooms. The married quarters are still more emphatically condemned. The single apartment allotted to a man, wife, and three or four children, has no domestic conveniences of any kind, and absolutely no ventilation. It appears that the hospital has been repeatedly condemned, but as often patched up at considerable cost. Half the building is again in the hands of the engineers for repairs, which will be equally misplaced. The water-supply is intermittent, and the commissioners deem it incredible that the War Department should be guilty of such a piece of economy at the risk of the health and lives of the men in such a costly establishment. The sanitary condition of the men is good, which seems owing mainly to the extraordinary sanitary precautions carried out, not at the expense of the Government, but of themselves. Three men are employed to flush the drains, urinals, latrines, &c., daily, and to sprinkle them with disinfecting powder. The labour, expense, and supervision bestowed are worthy of the highest commendation, but do not justify the postponement of more permanent reforms. The commissioners recommend the removal of the barracks to a more appropriate site, and the sale of the valuable land and buildings to defray some portion of the cost.

Of the Windsor Cavalry Barracks, reputed to be the *chef d'œuvre* of the military engineers, complaint is made that the barrack, although constructed for half a regiment, is now forced to contain a whole one. Horses worth several hundred guineas each have so little room that it is dangerous to pass behind them. The barrack-rooms are more spacious. Here, also, as in the other barracks, the meals are eaten in the sleeping-rooms. At the end of each room, and approached by a short corridor, are the lavatory and urinal, fitted up with the latest patents. But the misfortune is that they are continually out of order. There was not a single urinal which did not stink abominably, and the floor of nearly every lavatory might reasonably be called a lake, from leakage from the pipes. In one instance the thoughtful ingenuity of the corporal has placed a pair of heavy boots for those who desire to wade across without wetting their feet. The water-closets appear to yield an excellent annuity to their ingenious inventors. Those, for example, in the officers' quarters have never been in working order for a fortnight together since they were put up. There is an insufficient supply of water: not a drop in any of the taps; and this is said to be of almost daily occurrence. Cases of scarlatina have been constant in the portion of the barrack set apart for families since April last, and one of the married sergeants is now in hospital. Any day it may extend to the troopers' quarters. The state of the water supply is simply disgraceful. Many of the tanks are nearly always empty. There is not enough for ordinary cleanliness, much less for flushing drains and watering roads. The hospital is spoken of in terms of almost unqualified approbation. The wards are lofty, light, and well ventilated; the floors and furniture exquisitely clean; the walls panelled shoulder high, and decorated with prints. A protest is entered against the employment of complicated sanitary machinery without proper skilled supervision. In conclusion, the *Lancet* commissioners express their belief that simple arrangements and daylight are the best remedies for dirt and filth, and that a proper sanitary state can only be maintained, where large numbers of men are congregated together, by making care and trouble obviously necessary.

In the House of Commons, since this last report was published, Sir John Pakington made a very unsatisfactory reply to a question which Colonel Leslie put to him with reference to the odious condition of the Windsor cavalry barracks. Sir John spoke of the failure of certain modern inventions for the promotion of cleanliness. Nobody doubts that these inventions sometimes fail and often get out of order, but that surely is no reason why matters should be made worse by gross neglect. So much complaint had been made on this subject, that last winter Sir John appointed a medical officer and an engineer to go through the various barracks of the country and report on their condition. These gentlemen have not made their report; but why have they not? and why, too, should it be necessary to appoint a commission of inquiry in order to insure in any barrack common respect for the laws of decency? Then, again, Sir John states, that during the last ten years the country had spent a quarter of a million in providing suitable quarters for married soldiers. Nobody doubts that the money has been spent; but it is not the less certain that the work of reform has not been satisfactorily accomplished.

STEAM CULTIVATION.

A LECTURE was delivered by Professor Coleman, of Estrick, York, upon the application of machinery to agriculture, at Brayton Hall, the mansion of Sir Wilfrid Lawson, on rent-day, to his tenant farmers and the gentlemen connected with the Wigton Farmers' Club. About 150 sat down to dinner in a large farm building fitted up for the purpose, and the company afterwards adjourned to another room to hear the lecture. Having sketched the history of steam cultivation, Mr. Coleman said the question they had to consider was how small farms of one to three hundred acres could have the benefit of steam cultivation. There could be no doubt that the double engine system was the best. If they had the land drained, capital, and the co-operation of the landlord willing to remove obstacles in this direction, the farmer would be justified in purchasing a double cylinder engine, and he would never regret it. The reason why steam cultivation had progressed so little was, that landlords would not support tenants in their enterprises. They were told to use steam as an auxiliary to horses, and he believed it was a beneficial and practical thing, and well worthy of consideration. He believed the time was coming when small farmers would come in for the benefits of steam cultivation. He did not suppose they had much faith in steam cultivation companies. They had nothing of the kind started. In the northern part of Shropshire, however, there was a company with more than eighty farmers on the books, who regularly looked for the steam plough, and were extremely disappointed if they did not get it. What had been done in Shropshire might be done in Cumberland. Let landlords and tenants combine, and they would find it answer the purpose. There had been disappointment felt that they had not more reliable information with regard to steam cultivation, but they must bear in mind that the whole thing was in its infancy. It was only within five or six years that machinery at all approaching practical form had been in use, and sufficient time had not elapsed for the collection of facts; moreover, farmers had no time or taste for collecting facts. It was all to be got at by general impressions. In many instances they were told absolutely that the crops had increased. The roots had undoubtedly been benefited in strong soils. As great a success had been achieved with regard to reaping and mowing by machinery as with regard to steam cultivation. He contended that a farmer's education was not complete unless he had acquired a practical knowledge of the management of machinery.

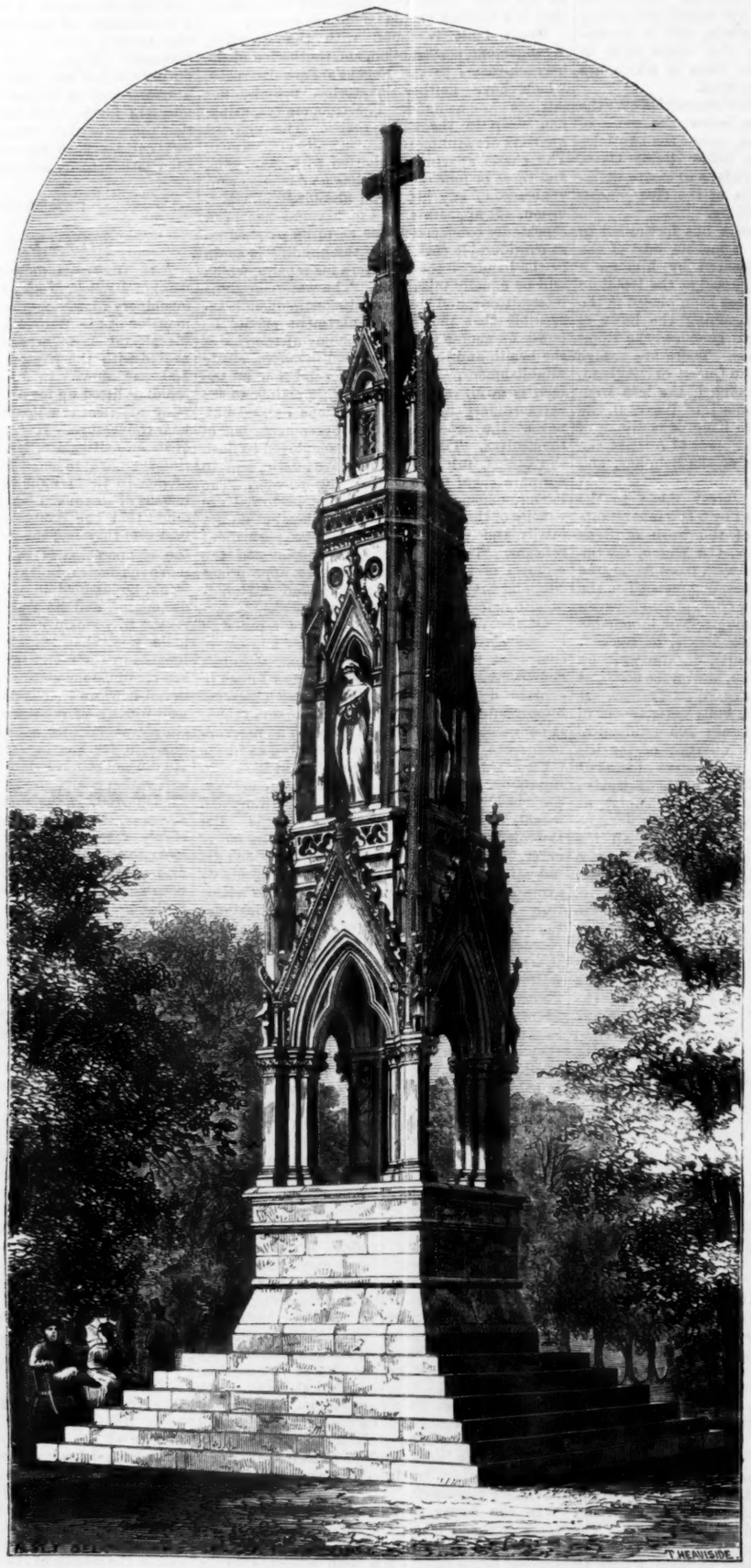
MEMORIAL OF THE LATE DOWAGER COUNTESS OF ELLESMERE, AT WALKDEN MOOR, MANCHESTER.

THIS monument is to the memory of Harriet Dowager Countess of Ellesmere, who died in 1866. She was widow of the first and grandmother of the present earl. Her good works among the labouring population and others on the estate will long be remembered, and the memorial which forms the subject of our illustration is intended to commemorate them.

Walkden Moor, the site of the monument, is near Worsley, the seat of the Earls of Ellesmere, and in the middle of the colliery district included in their extensive property.

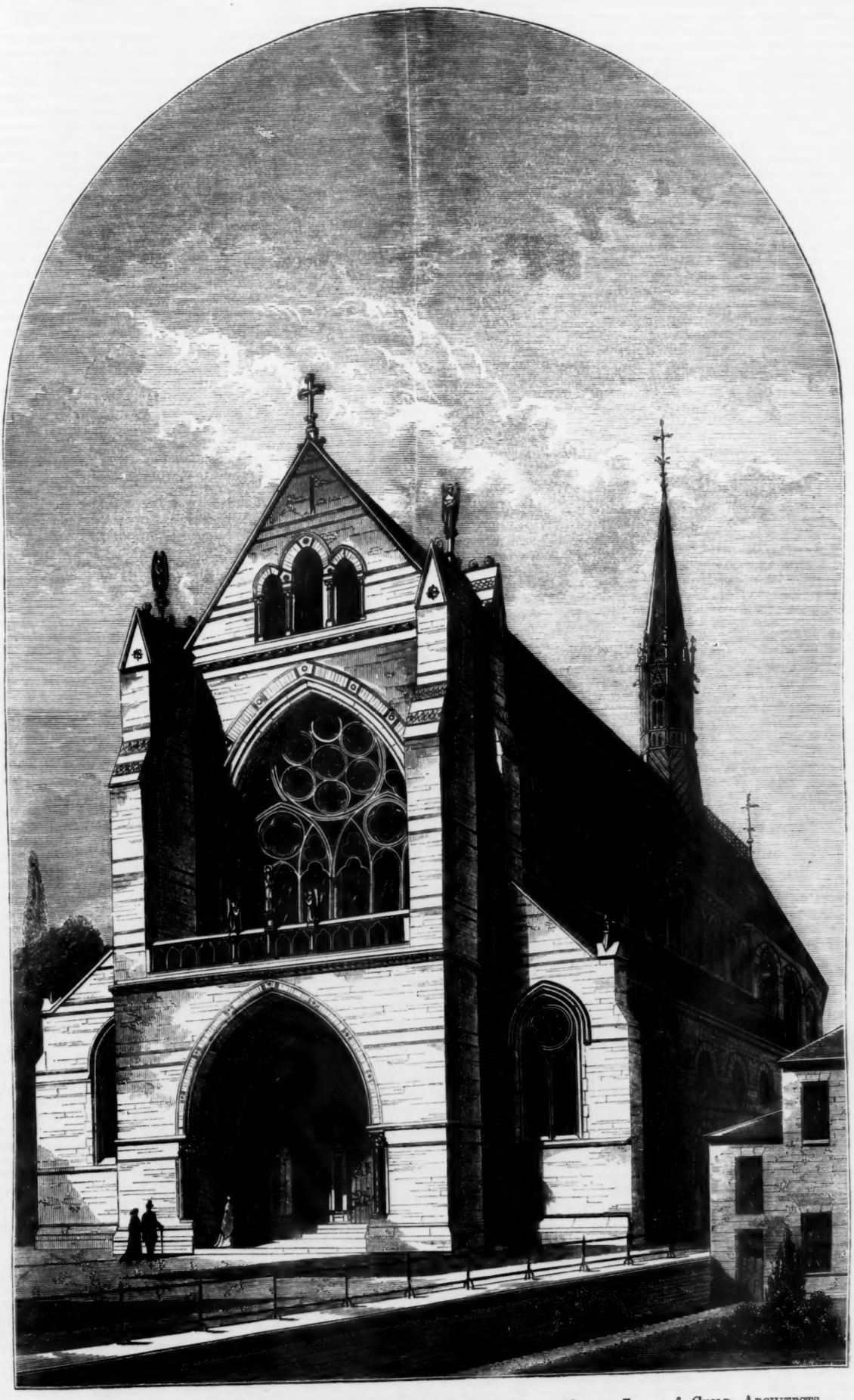
About fifty designs were submitted for the monument in answer to an invitation by advertisement. Mr. G. E. Street was consulted by the committee, and their final decision was made in accordance with his opinion.

The architect whose design was accepted, and is now being carried out as shown in the accompanying illustration, is Mr. T. G. Jackson, of London, Fellow of Wadham College, Oxford.



MEMORIAL OF THE LATE DOWAGER COUNTESS OF ELLESMERE, WALKDEN MOOR, MANCHESTER.

MR. T. G. JACKSON, ARCHITECT.



ST. MARY'S NEW R. C. CHURCH, KENSINGTON, MIDDLESEX.—MESSRS. GOLDIE & CHILD, ARCHITECTS.

[See p. 507.

MEMORIAL OF THE LATE F. W. FAIRHOLT.

A HANDSOME mural "brass," let into a slab of black marble has been prepared for this purpose by Mr. J. G. Waller, and is about to be fixed up in the church of Stratford-upon-Avon. It is thus inscribed:—"Frederick William Fairholt, F.S.A., artist and author, bequeathed his Shakespearean collections to the town of Stratford-upon-Avon. He died April 3, 1866, and was buried at Brompton. This tablet is erected to his memory by his friend and executor C. R. Smith." Above this there are three small crocketed canopies with a shaft at each side. Within the centre is the letter F, crossed with a pen and pencil. The foliage used is artistical, and the effect of the whole unpretentious and good.

The remark will not be out of place here, that Mr. Fairholt, by the disposition he made of his property, which was not large, has benefited the public to a much greater extent than is done by the majority of persons who die with ten times the amount of money at their disposal.

COMMITTEE ON LABOUR AND WAGES.

THE Social Science Association have appointed a committee for the purpose of spreading information as to the natural laws regulating the rate of wages and the supply and demand for labour. A great want of information exists as to the nature and operation of these laws. Mr. Overend, Q.C., has stated to the executive committee that, in his opinion, "almost all the crimes in trade matters originate in ignorance." It is this ignorance, wherever existing, which the association desire to remove. In forming the committee they have sought to present to employers, to the working classes, and to the country generally, a list of names calculated to inspire confidence in the disinterestedness of the promoters of the object in view and in their ability to carry on the work wisely and efficiently.

Besides spreading abroad information on the laws which regulate wages, an attempt will be made to induce employers to avail themselves of the last amendment of the law of partnership, which enables them, without risk, to pay their work-people, in part, by granting them a share in the profits, so as to give them in some degree the interests and feelings of proprietors; and also to promote amicable conferences between operatives and their employers, such as have so long been in successful use at Nottingham and elsewhere.

We are enabled to give a list of the committee:—Messrs. Edward Akroyd, M.P.; Rev. Samuel Bache; Arnold Baruchson; T. B. L. Baker; Thomas Barnes, M.P.; James Beal; Thomas Beggs; Adam Black; C. H. Bracebridge; Thomas Brassey, jun.; Thomas Briggs; H. C. Briggs; Samuel Brown; the Right Hon. H. Austin Bruce, M.P.; Charles Buxton, M.P.; Sir T. F. Buxton, bart., M.P.; Nathaniel Caine; David Chadwick; Edwin Chadwick, C.B.; F. S. Corrance, M.P.; Samuel Courtauld; Right Hon. William Cowper, M.P.; Rev. R. W. Dale; W. T. S. Daniel, Q.C.; the Hon. George Denman, Q.C., M.P.; Sir Wentworth Dilke, bart., M.P.; George Dixon, M.P.; Earl Ducie; Lord Dufferin and Clandeboye; Andrew Edgar, LL.D.; William Ewart, M.P.; William Fairbairn, LL.D., F.R.S.; Professor Fawcett, M.P.; H. W. Freeland; George Godwin, F.R.S.; Sir Francis H. Goldsmid, bart., M.P.; Julian Goldsmid, M.P.; Walford Greatorex; E. O. Greening; Right Hon. Russell Gurney, Q.C., M.P.; Thomas Hare; G. Woodyatt Hastings; William Hawes; Charles Hawkins; Edwin Hill; Frederic Hill; M. D. Hill, Q.C.; W. B. Hodgson, LL.D.; Lord Houghton; John Howell; Thomas Hughes, M.P.; J. R. Jeffrey; Thomas Jessop; Professor Stanley Jevons; Hon. Arthur Kinnaird, M.P.; W. C. Leny; Right Hon. the Earl of Lichfield; Darnton Lupton; Lord Lyttelton; J. McClelland; Horace Mann; Hugh Mason; Samuel Morley; Walter Morrison, M.P.; J. W. Murland; Charles Neate, M.P.; William Newmarch, F.R.S.; W. Overend, Q.C.; Charles Paget; Rev. Mark Pattison; Professor Lyon Playfair; John Plummer; Edmund Potter, F.R.S., M.P.; Hodgson Pratt; Robert Rawlinson, C.B.; Earl Russell, K.G.; Arthur Ryland; W. Lucas Sargant; Russell Scott; William Shaen; Sir J. Kay Shuttleworth, bart.; Robert Slater; Rev. S. A. Steinthal; Robert Stuart, Q.C.; Colonel Sykes, F.R.S., M.P.; P. A. Taylor, M.P.; J. Pitt Taylor; Seymour Teulon; William Tite, F.R.S., M.P.; R. R. Torrens; H. S. Tremenheere; Sir Walter C. Trevelyan, bart.; E. Carlton Tufnell; Sir Harry Verney, M.P.; Thomas Webster, Q.C., F.R.S.; T. W. Weguelin, M.P.; Sir J. Eardley Wilmot, bart.; his Excellency M. Van de Weyer; Professor John Wilson.

The meeting whereat this committee was appointed was presided over by the Right Hon. W. E. Gladstone, M.P. The speakers were (in the order of their speaking) Sir John Kay Shuttleworth, Mr. Godwin, Mr. Ludlow, Mr. Applegarth, Mr. Neate, Mr. G. W. Hastings, Mr. Dering, Mr. John Ruskin, Mr. Hare, Mr. Mundella, Mr. Thos. Hughes, M.P., and Mr. Taylor.

A FEW THOUGHTS ON STRIKES, TRADES UNIONS, LABOUR, AND CAPITAL.

SIR,—At no time in the history of our country has the relation of employer and employed been more unsatisfactory, or the war between capital and labour been more deadly. The harmony which once existed between the contending parties is gone, and a new order of things is in existence. The hewers of wood and the drawers of water believe they are unfairly dealt with by the upper and employing classes, and are by combination fighting for a larger reward for their labour. Although this movement is more noticeable among those who receive weekly wages, there is not any doubt but that the movement has extended to every class of society. Any one who can for a short time cast aside class prejudices, and impartially view the present state of things, must come to the conclusion that the working classes are not alone in an unsatisfactory condition, but that the body politic is almost rotten to the core.

As the condition of the labouring classes is largely influenced by the actions of the classes above them, I think it may be fairly assumed that the agitations which have for some time characterised them are, after all, but a reflex of the selfishness of the other classes. In looking around we see that political life, as represented by the ruling parties, is out of joint. Principle, which ought to be the guiding star, is cast to the winds,—one section trying to outbid the other. Their only aim seems to be place, and the distribution of State loaves and fishes, whilst great social and educational measures are neglected, to the nation's injury and loss. Can it be wondered at, that under this low state of morality, the workmen should make demands which are, in many instances, injurious to their class? The present state of the nation is more unsatisfactory than it has been for a long time. The registrar's returns state there is a large increase in pauperism, and a decrease of trade, whilst local taxation is also on the increase. These are matters which affect all classes, and if a change do not soon take place, must bring disaster and ruin to every portion of the community. The workmen seeing the apparent prosperity, and that a rise takes place in various articles in daily use, demand a higher price for their article—labour; and looking at it from their point of view, there seems nothing wrong in that demand. Nevertheless, I have often thought the members of trade societies place too much reliance on their unions to gain whatever demands they may in their ignorance or wisdom think fit to make. Their places of meeting are not fitted for a calm consideration of the important subjects brought before them; and under the excitement of Boniface's adulterations, they are ready for war upon any real or imaginary issue. Often the boast is made that a thorough union of the working classes would accomplish any desire, forgetting that there is a limit to the price of every commodity, and that by raising its price to a fictitious value, they in the end do an injury to themselves, and society soon finds other means to supply its wants; or else there is an influx of outsiders into their trade or trades which is paid so much better than others, so a corresponding fall takes place, and the last condition of that class is worse than its first. Society in the aggregate is generally left out of account by the unionists, and they act as though there were no opposing force to their demands. What I more particularly find fault with is their rashness in not calculating the effect that a rise of wages creates. Often a strike takes place, and society is plunged into a wages war by the crotchets of a few individuals, without the slightest prospect of a successful result; and even if it happens that success is by some chance with the operatives, it is but the prelude to a general rising of other trades. As war between two countries on a great continent excites the passions of all others, a wages war is no exception, but causes a general commotion and a general rise in all commodities consumed by them. If not at once apparent in the price, the difference is made up by adulteration; and, on the whole, the apparent gain is a loss. It also appears to me that the workmen cannot by their strikes interfere with or limit the employer's profits, and, therefore, they cannot affect his position in the relations which he before had with his men. The employer would still have the same amount of capital in his business, and his interest or profit on his capital would remain; but it would affect the workman, as the enhanced cost of the article to the consumer would restrict the demand, whilst he received less for his money; and his income in many instances being fixed, a less quantity would be produced and a less number of labourers required. Those thrown out would have to seek other employment, or be a burden to their society. Such appears to me to be the effect of a continual agitation for a rise in wages. Although it is an imperfect sketch, it might be enlarged; but I think it is borne out by the experience of the past few years and in the reports of the great trade societies.

Another fallacy of the unionists I will touch upon. At the Manchester conference, it was assumed by the whole of the delegates that the low remuneration of slop-workers and others was due to their not having a union. The delegates forgot that the value of slop-work and other easily learnt trades, which require no mental and but little physical energy, is fixed by society, or, as some have it, by the law of supply and demand; and it is self-evident to every one who has passed a moment's rational reflection on it that all departments of labour which are easily acquired will always be badly remunerated, and all the unions in existence cannot for even a short period alter what is a natural law. I am not one of those who are blind to the advantages of association, or want to abolish trades unions; but I think, in spite of all the leaders claim for them, their action has not been always beneficial to the workers, and that great improvements are needed to make them really advantageous to society. Being disappointed of a ticket for the meeting on Saturday at the rooms of the Society of Arts, I jotted down a few thoughts as my contribution, and have sent them to you, sir, thinking that they may not be out of place in the columns of the *Builder*.

JACK PLANE.

RIVER POLLUTIONS.

THE RIVER THAMES.

IN the third report by the Rivers' Pollution Commission, that on the Aire and Calder, it is stated that rivers are polluted and obstructed by semifluids and solids, to the extent of hundreds of thousands of tons annually. The fluids, consisting of town and house sewage, as also of dye-refuse and waste washing and scouring water; the solids being furnace-ashes, foundation-material, sludge from reservoirs, road scrapings, and every other kind of refuse in a solid form, thrown away by a large population. Whatever restrictions Parliament may put on river pollutions in general, we think that the casting in of solids and of sludge, will be prohibited. The solids and sludge may be abstracted, both from sewage and from waste dye-water, and experiment has shown that even the colouring matter of black dye can be taken out by mere liming and mechanical filtration, either through furnace ashes or through Needham's press. Solids and sludge are extracted from sewage by liming and subsidence in several places, and with most beneficial effects to the adjoining streams, as the volume and weight of sludge abstracted shows. London, by some means, appears to have escaped the obligation of removing sediment and sludge from its sewage before discharging it into the Thames, hence the regret now as to blocking this river at Barking, both above and below this point. The Metropolitan Board surely form a strange notion of their duties if they think that the purification of the Thames is effected by what they have done and by what they are doing. A writer in the *Engineer* (July 3rd) states that "about 1,338 tons of solid filth finds its way into the river at Barking daily;" this makes no less than 488,370 tons of solid filth

annually. This weight and volume may probably be in excess, and the terms, "*solid filth*," a little confusing. The statement as to volume and weight may, however, not be far from the mark. If the Metropolitan Board is compelled (as it ought to be) to remove the solids and sludge of sewage, there probably will be not much less than 300,000 tons of sludge to abstract and deal with annually. At Birmingham, the corporation of that town has to deal with upwards of 30,000 tons of sludge per annum, and the work is imperfectly performed. London may be set down at ten times the population of Birmingham, and if the weight of sewage-sludge is also ten times greater, there will be some 300,000 tons per annum to be removed. This vast body of sludge has, however, been sent year by year through the Barking sewer mouths into the unfortunate river Thames, which was to have been purified by the very costly operations of the Metropolitan Board. What is the meaning of this pollution? What is it capable of doing? 300,000 tons of sludge would form a bank having a cross-sectional area of one yard, or 9 square feet, 170½ miles in length, or it would form a lake of sludge of sixty-two acres in area and one yard in depth; or it would coat both banks of the Thames with sewage-mud 20 miles long, 17 yards wide, and 9 in. thick. It is not assumed that fouling of the Thames in this form and to this extent actually takes place; as that which is soluble of this sludge in the tidal water is scoured up; and, with the estuary and river mud, oscillates about; but some of the foul sewage-matter coats the margin of the river both above and below the point of discharge, just as Sir G. Gurney stated would be the case. Those who navigate the river find foul banks of sewage-matter, and the engineer to the Thames conservators complains of the obstruction caused to shipping; those who work on the river, and also those who live on both banks in the vicinity of the outfalls also complain loudly of the stench they have to endure. Are these to be all the results of the Metropolitan Main Drainage Works, which have cost some four millions of pounds sterling?

COMPETITIONS.

Basingstoke Mechanics' Institute.—The committee having received eighteen designs, have selected one which was found to be the joint production of Messrs. Messenger & Gundry and Mr. W. Seymour, of London.

Slough Church.—The committee have made their final choice of the plans for the new parish church. The plans selected are those of Messrs. F. & H. Francis, of London, whose motto in the competition was "*In Domino confido.*" The tower is at the south-west angle. The principal entrance is by a south porch. The church will accommodate 1,200 persons, and it will cost about 10,000*l*. The site is between Mackenzie-street and the Stoke-road, near the railway station.

THE KINESCOPE, A NEW PHOTOGRAPHICAL BIJOU.

MM. LANGLOIS & ANGIERS, of No. 14, Rue de Castiglione, Paris, have constructed a clever little apparatus, to which they have given the name of *kinescope*, showing objects in relief and in motion. To show them in relief does not require couples of dissymmetric photographs, as those used in this apparatus are microscopic, and each of the photographs is separately shown in relief. The movement consists only of two different positions of the subject, the first and the last, without passing through the intermediate positions, so that two images only are necessary. The apparatus, thus amazingly simplified, is contained in a small oval locket, the greatest length being about ¾ in., and the two photo-microscopic cylinders are placed in the centre of and perpendicular to the face of the *breloque*. They represent the same object in two positions, and the effect of change of position is obtained by a very simple mechanism. The two photomicroscopic cylinders are placed in a vertical guide, surrounded by an india-rubber membrane, on which rests a vertical pin, terminated by a small button on the top of the locket. For instance, in the locket we examined, on looking through the central aperture, the normal state of the apparatus shows a little child holding in its outstretched hand an india-rubber ball, which he contemplates with evident pleasure, the head being bent towards it. But, if the button be pressed down with the finger, the force exerted on the caoutchouc changes the relative position of the cylinders, and, the first image disappearing, the second image is brought to view, showing the ball thrown up into the air, while the head is thrown back to watch the movement of the projectile. If the motion of the finger be rapid enough, the images succeed each other instantaneously; and, owing to the persistence of images on the retina, the illusion of the child tossing up the ball is perfect. Thus, by this very ingenious idea can be produced the effect of a distant or departed friend appearing full of life.

FROM AUSTRALIA.

Melbourne.—St. Patrick's (R. C.) Cathedral, in course of erection on Eastern-hill, is making progress. The whole plan of the cathedral comprises nave, transepts, and choir, with aisles to each on both sides. The choir has an apsidal end, and five chapels open out from the aisle which surrounds it. There are to be two towers with spires, each 220 ft. in height, at the south-west end of nave, and a lantern tower and spire, 330 ft. in height, at the intersection of the nave and transepts. The extreme length of the church inside is to be 345 ft., and to extend across the whole Reserve to Albert-street. The width inside of nave and aisles is 76 ft. The inside length of the transepts is 160 ft., and the height to the ridge of the roof is 92 ft. The design proposes remodelling the present house for the bishop, to form part of the grammar-school buildings, and includes a plan for a new house for the bishop, with chapter-house, sacristies, cloisters, &c. Comprehensive as is the design, it is only intended to complete it by instalments, and at present the works only of the nave and aisles, with the two western towers, have been commenced. The nave and one aisle are now roofed in, and nearly completed, and the stone vaulting of the second aisle is making rapid progress, so that, in all probability, this part of the church will be completed in four or five months; and, when it is completed, the transepts and central towers will be commenced as the next instalment. The fittings inside are all temporary. One of the towers is up, ready to receive the spire, and the other is complete to the floor of the upper belfry. Some of the bells have been hung in the eastern tower. The stained glass in the principal window of the nave is by Messrs. Hardman, of Birmingham. The subject is the Ascension of our Lord. The works of the cathedral have been carried out, under the superintendence of Mr. Denny, by Mr. Young, the contractor, who has recently executed the Independent church in Collins-street. The architect is Mr. Wardell, now inspector-general of public works.

The City Council has begun to move in the matter of sewerage, and there has been an interview between the Sewerage Committee and the Commissioner of Public Works. They went to look after a special grant of 200,000*l*., made for Melbourne *sewerage* in 1853. The Commissioner of Public Works replied that nearly six times that amount had since been spent in supplying Melbourne with *water*; and he implied that to mention the 200,000*l*. at this time of day was somewhat cool. In the mean time Dr. Girdlestone, the health officer, is keeping the Health Committee up to their work, and there is to be a *coup* upon those sources of pollution the cesspools which drain into the streets and the unmade lanes, and especially upon an open sewer which drains from the hospital into Swanston-street.

The place called the Western Market, where some bluestone ruins have been an eyesore for a long time to the architectural appearance of the west portion of Collins-street, is now turned to account as a site for a pile of buildings in course of erection, which, when finished, will form a block having a frontage of 230 ft. on Collins-street, 300 ft. on William-street, 230 ft. on Little Flinders-street, and 300 ft. on Market-street, arranged for twenty-eight large and distinct places of business. The Anglo-Italian style of architecture has been adopted. In each of the four respective façades there is a central pile with wings of increased heights to that of the remainder, and to these there are groups of coupled Roman Doric columns, supported upon panelled and moulded stylobates, and surmounted by the usual Roman Doric entablature. The windows in both stories are circular-headed, those on the ground story having rusticated piers and arched heads; and the others will be finished with archivolts, imposts, and enriched key-stones. The entablature over these is of the Ionic order, with a balustraded parapet with moulded piers and blockings, and each pier finished with an enriched finial. The whole has been designed and is being carried out under the superintendence of Mr. John M. Barry, architect. The *Australian News*, which keeps its readers well posted in illustrations of new buildings, gives an engraved view of the buildings.

The City Council have ratified a contract for the construction of a portion of the new cattle and sheep market, at Flemington. Designs had been called for and premiums awarded for two approved plans. But neither plan was adopted, from their unsuitability in some respects to the views of the Corporation, and the city surveyor was accordingly instructed to execute a design embodying such portions of the premium plans as were considered most adapted to the extent of the ground and the requirements of the cattle salesmen. This plan has, for convenience, been subdivided, and the first portion of the work about to be undertaken has been let to Messrs. Plant & Parker at 9,399*l*. The market committee of the City Council determined to use red gum for posts, and that only of the very best quality procurable. The contract embraces the erection of delivery and cattle yards and calf-pens, and will cover about nine acres. There will be no less than 340 gates required for admission to the drafting and cattle yards, and calf-pens. There is a considerable amount of levelling to be done, and the yards are to be pitched throughout. The present contract is for the accommodation of cattle and calves, and, as soon as the work is finished, the old sheep-pens will be entirely remodelled at a further cost, which will increase the expenditure by something like 20,000*l*., making the gross outlay upon the whole yards little short of 30,000*l*.

FROM IRELAND.

Cork.—On the last day of the period fixed for raising the sum of 12,000*l*. required to complete and open the cathedral for divine service, there was a large meeting held in the Protestant Hall, the Bishop of Cork being in the chair. The Rev. Mr. Gregg stated how the collection stood. They had collected 9,401*l*., and there was consequently a deficiency of 2,600*l*. He then announced amid enthusiastic cheering that Mr. Francis Wyse, of the city of Cork, and lately connected with the famous distillery, desired him to say that he had noticed the manner in which all classes had contributed towards the work, and that he would make up the deficiency. The whole amount was thus subscribed as promised, and the work proceeds with all possible speed.

PROVINCIAL NEWS.

Doncaster.—The building recently completed for the Doncaster Infirmary and General Dispensary has been formally opened by the mayor and the Rev. J. Campion. There are altogether five wards,—one male accident ward, two male medical wards, and two female medical wards, which are constructed to contain twenty-five beds. There is also accommodation for two nurses. The full complement of beds, however, has not been fitted up, twelve being thought sufficient for present requirements. The beds are fitted up in a style precisely similar to that adopted at Manchester, and are provided to meet the necessities of different cases, some with spring mattresses, some with hair mattresses, and others with flock beds. The ventilation is all by the windows, the result of the inquiries made by a committee appointed in connexion with the Leeds Infirmary to investigate the subject, being to the effect that window-ventilation was upon the whole the most reliable and the best. The majority of the windows are louvres, being divided into four sections, which work on a lever, and are opened by a vertical rod. They open so that the air enters in an upward direction, intended to prevent draughts being felt by the occupants of the beds below. The blinds, a patent of Messrs. Gardner & Son, Glasgow, are constructed of thin strips of wood, and while requiring no washing, which seems to

be regarded as an advantage, are durable. There is no fever ward.

Ringwood.—The new corn exchange at Ringwood, Hants, has been opened. It is in the Italian style of architecture, and occupies a position in the centre of the town. It was designed by Mr. Thomas Henry Wyatt, of London, architect. The front of the structure towards the street is three stories in height, part of the upper story being arranged in the curved roof. The building is entered through a stone archway of 7 ft. clear opening. The exterior of the archway has cinctured three-quarter columns, and a stone cornice over same, projecting and forming a balcony, which is enclosed with a wrought iron railing. The central part of the building over the doorway has a semicircular-headed window, the opening of which is broken up by the woodwork of the frame. The general facing material is red brick, and all the dressings are executed in Bath stone. The exchange hall is 72 ft. long, and 37 ft. 6 in. wide. It has an open-framed timber roof, with glass to the uppor portion. The sides of the hall are relieved by the introduction of red brick piers or buttresses. The general facing of the interior is yellow brick, red work being used in the arches, imposts, &c. The west side has semicircular-headed windows, and the east side wall is occupied by blanks corresponding in outline with the windows on the opposite side, at the end of the hall. The balcony or platform is about 19 ft. by 9 ft. At the top of the grand staircase, and entered from a spacious landing, is a large room over the lower offices and corridor; this is a room 40 ft. by 19 ft., and 14 ft. high, and is, we believe, to be used for magisterial and other purposes. The rooms in the upper portion of the exchange are arranged as bedrooms in connexion with the White Hart Hotel adjoining. The building of the exchange and the whole of the work in connexion therewith has been carried out by the firm of Joseph Bull & Sons, of Southampton, and no clerk of the works has been employed.

MONUMENTAL.

The Palmerston Memorials.—It is finally settled that the inauguration of the Palmerstcn memorials at Romsey shall take place on Tuesday, July 21. A special service will take place, and a sermon be preached by the Bishop of London. At the termination of the service a procession will be re-formed and proceed to the market-place, when the statue will be uncovered, and an inaugural address be delivered by one of the late Lord Palmerston's colleagues. The park and grounds at Broadlands will be thrown open, and the band of the Royal Marine Artillery will perform there. In the evening the vicar will illuminate the western window of the abbey.

The Jones Memorial at Sandhurst.—A new monument is about to be erected in the chapel of the Military College at Sandhurst in memory of the late Lieut.-General Sir Harry Jones, G.C.B., who was long the governor of the college. The monument, which is the work of Mr. Gaffin, of London, is of white Carrara marble upon a black ground. At the top are carved the old Ordnance arms and a field officer's sword, and at the bottom, on the plinth, his family arms, &c. The central part, or table, is surrounded by a carved wreath of oak-leaves, bearing the names of the many engagements in which he had served, and the inscription.

CORN HARVESTING IN WET WEATHER.

THE present season is suggestive of anything but wet corn sheaves; but an experiment which has been tried at Gilwell Park, near London, depends in no way upon a rainy sky or a given day for its importance. Mr. G. Gibbs, who resides at Gilwell Park, has just succeeded amongst twenty competitors in winning the prize offered by the Society of Arts for the best practical essay on the question how to harvest corn in wet seasons; and on the occasion referred to he invited a party to witness the apparatus at work. As described by the *Gardener's Chronicle*, the hot breath of a steam-engine diverted from its ordinary exit is driven, by means of a blower, into a cavity underneath an artificial floor of sheet-iron, which floor is crocketed with hollow upright cones or funnels, open at the apex, and placed at such intervals as to allow the wet sheaves to be stooked upon them, as close as may be, to receive the drying blast up through their centres, from the funnels on which they stand. Of course the chamber is closed as soon as the sheaves are thus disposed within it; and the heat inside is soon considerable, absorbing every particle of moisture, and allowing the stooking process to be quickly repeated upon another wagon or cart-load of sheaves—that is, wet—fresh from the field. For the treatment of damp, or half-made hay, a simpler plan is adopted, the hay being merely shaken before the drying blast of the engine, the effect of which in rapidly driving off every particle of moisture caused some surprise among those present.

OPERA AND STAGE.

Royal Italian Opera, Covent-garden.—Gounod's "Romeo e Giulietta" goes remarkably well at the Royal Italian Opera House, and has given a triumph to Madlle. Patti especially. We cannot agree, however, with those critics who have said that the acting of this lady in the part (good as it is) is equal to her singing. There was a want of elegance in her movements at times which might with ease be remedied, and this would greatly increase the spectator's pleasure. Of her singing no one word of qualification need be said: it was unexceptionable from beginning to end. Signor Mario played and sang his part on Monday evening charmingly. Signor Bagagiolo, as *Friar Lawrence*, Signor Cotogni as *Mercutio*, Neri-Baraldi as *Tybalt*, Petit as *Capulet*, and Madlle. Locatelli as the page, all deserve more than a word of praise. The scenery is admirable: we must particularly notice the ball-room, a Venetian interior with a wealth of carvings, marbles, inlays, and colourings, and the gardens and terrace at night.

The Princess's Theatre.—It is much to be regretted, in the present dearth of talent, that so graceful, touching, and, on occasion, powerful an actress as Miss Kate Saville is should be so often absent from the London stage. A new version of Mosenthal's "Deborah," titled "Ruth," gives her, in the part we have known as *Leah*, scope for the display of her abilities. It was fully taken advantage of, and secured her the hearty and unanimous applause of the house. She was exceedingly well supported by Mr. J. G. Shore, certainly one of the cleverest and most versatile actors on the stage. An actor new to London, Mr. Allerton, is playing *Hamlet* here with considerable intelligence and art; Mr. Shore making an excellent *Horatio*.

CONVERSAZIONE OF THE INSTITUTE OF ARCHITECTS.

THE *conversazione* of the Royal Institute of Architects was held at the House, in Conduit-street, on Wednesday evening, the 1st of July. The rooms and approaches were painted and decorated on the occasion, large numbers of flowers lending their aid with pictures and models to form a sparkling *ensemble*. The principal contributors were the president (Mr. Tite, M.P.), who received the guests, Professor Donaldson, Mr. F. Leighton, R.A., and Mr. Sandys, whose picture of Medea, an elaborately finished work, attracted considerable attention. Mrs. Marrable contributed some fine Indian jewelry. Amongst these present, about 600 in number, were Professors Scott & Donaldson, Drs. Bird, Druitt, Barlow, Oppert, Dickson, Sir Bartle Frere, Colonel Sykes, M.P., Messrs. Beresford Hope, M.P., E. M. Ward, R.A., E. Smirke, T. H. Wyatt, E. Corbould, Charles Mayhew, Vaux, H. Baker, B. Ferrey, Slater, W. P. Griffith, F. Cockerell, G. Truefitt, F. M. Brown, Critchett, Pugin, Marcus Stone, Chas. Martin, Wyburd, M. D. Wyatt, Westcott, Woodward, C. Fowler, W. Cave Thomas, G. Mair, Grantham, Dunnage, L. Wyon, H. Roberts, E. Hall, Walter Severn, Worthington, Gordon Hills, A. Donaldson, E. B. Lamb, W. Papworth, Collman, A. Moseley, F. Marrable, Allom, Hiscocks, Darbyshire, Edmeston, Spiers, Hakewill, Lameir, Blashfield, I'Anson, Burges, Houle, Roger Smith, D. Brandon, W. White, H. Oliver, Lewin, J. Norton, C. Eastlake, Tarn, J. Thomson, H. Shaw, Sidney Godwin, G. Godwin, &c., &c.

There were also many ladies. The band of the Coldstream Guards played during the evening in the Architectural Exhibition gallery, which was open for the occasion.

CONFERENCE OF INSTITUTIONS AT THE SOCIETY OF ARTS.

THE seventeenth annual conference between the Council of the Society of Arts and the representatives of the Institutions in Union and Local Educational Boards was held on Friday, the 19th ult., at twelve o'clock, noon. Mr. William Hawes, F.G.S., chairman of the Council, presided.

The Secretary having read the annual report of the Council,

The Chairman invited discussion upon the report, and also upon the programme of examinations for the ensuing year, as well as upon a list of subjects which had been suggested.

The only resolutions formally agreed to in course of the discussions were the following:—

"That this conference, having heard a statement of Mr. Curwen's plan for a system of prizes and certificates in elementary musical composition in connexion with the Tonic Sol-fa School, beg to recommend them for the adoption of the council."

"That this conference, agreeing with the Metric Committee of the British Association for the Advancement of Science in the importance of diffusing information on the metric system of weights and measures, highly commends the proposal to institute a prize to be given to the candidate who exhibits the greatest knowledge of the principles and practice of the same, and commends the subject to the earnest attention of the council."

"That the council be requested to enter into communication with the Government, with the universities, and with such other bodies concerned in public education as it may seem expedient, with a view to ascertain how far it is possible to combine the various examinations that are now in use, and to render them more generally useful in promoting the general and technical education of the people."

The Chairman said the last four questions on the list, Nos. 6, 7, 8, and 9, appeared to form one class, and they were, therefore, considered together, but no formal resolution as to them was agreed to. The conference, however, was agreed as to the desirability of opening museums and galleries in the evenings. There was a difference of opinion as to Sunday afternoons. The council have announced in the Journal of the Society of Arts that a discussion having taken place on the subject of workmen's holidays at the conference of representatives, the council would be much obliged to any manufacturer or other employer of labour who, having tried the plan of allowing his workmen to take their holidays at once, rather than piecemeal, would communicate his experience to the secretary.

SUFFOLK PRIZE COTTAGES, 1867. AGRICULTURAL ASSOCIATION, IPSWICH.

THE Suffolk Agricultural Society have published the plans for a double cottage to which they awarded their offered premiums of 25*l.* and 15*l.*, as well as four other of the plans. They give, also, a general specification and particulars of cost. For 4*s.* the publication may be obtained; and though we do not discover anything particularly new in the plans, many will find the purchase a good investment. The committee give the following hints:—

"Employ a tradesman to whom you can with confidence advance, if necessary, 40*l.*, in order that materials may be purchased with ready-money. Give your orders in September, so that the builder may prepare all woodwork, and do such brickwork as weather will permit, and when wages are the lowest. If stones and sand are plentiful, before deciding to build of brick, inquire as to concrete lump, which the committee are assured by a gentleman,* who has used it extensively, makes a stronger and drier work at half the cost of brickwork, thus effecting a saving of about 20*l.* in a double cottage. By brick-on-edge hollow work a considerable saving in brick is effected. By pan-tiling instead of slating about 8*l.* is gained."

PREMIUMS OF THE INSTITUTION OF CIVIL ENGINEERS.

THE Council of the Institution of Civil Engineers have just awarded the following premiums for original communications submitted to the Institution, and read at the ordinary meetings during the sessions 1867-68.

1. A Telford Medal, and a Telford Premium, in books, to G. Higgin, for his paper, "Irrigation in Spain, chiefly in reference to the Construction of the Henares and the Esla Canals in that country."
2. A Telford Medal, and a Telford Premium, in books, to C. P. Sandberg, for his paper "On the Manufacture and Wear of Rails."
3. A Telford Medal, and a Telford Premium, in books, to Lieut.-Colonel O'Connell, R.E., for his paper "On the Relation of the Fresh Water Floods of Rivers to the Areas and Physical Features of their Basins."
4. A Telford Medal, and a Telford Premium, in books,

* Mr. J. T. Clarke, Newmarket; see letter in *Royal Agricultural Journal*, vol. xxiv., part 2.

to W. Wilson, for his "Description of the Victoria Bridge on the line of the Victoria Station and Pimlico Railway."

5. A Telford Medal and a Telford Premium, in books, to C. Douglas Fox, for his paper "On New Railways at Battersea; with the Widening of the Victoria Bridge and Approaches to the Victoria Station."

6. A Telford Medal and a Telford Premium, in books, to J. Wolfe Barry, for his paper "On the City Terminus Extension of the Charing Cross Railway."

*7. A Watt Medal to Edwin Clark, for his paper "On Engineering Philosophy: the Durability of Materials."

8. A Telford Medal to W. Jarvis McAlpine, for his paper "On the Supporting Power of Piles; and on the Pneumatic Process for Sinking Iron Columns, as practised in America."

9. A Telford Premium, in books, to T. Login, for his paper "On the Benefits of Irrigation in India; and on the proper Construction of Irrigating Canals."

10. A Telford Premium, in books, to Allan Wilson, for his paper "On Irrigation in India."

11. A Telford Premium, in books, to Wilfrid Airy, for his paper "On the Experimental Determination of the Strains on the Suspension Ties of a Bowstring Girder."

12. The Manby Premium, in books, to A. C. Howden, for his paper "On Floods in the Nerbudda Valley; with Remarks on Monsoon Floods in India generally."

CIRENCESTER CONGRESS OF THE BRITISH ARCHÆOLOGICAL ASSOCIATION.

THE proceedings of the Congress will be as follows:—

Monday, August 10. — At Cirencester. — Inaugural address of the president (Earl Bathurst) at 3·30 p.m., at the Assembly Rooms.—Examination of the church and town-hall.—Dinner at the Assembly Rooms.

Tuesday.—At Cirencester.—Inspection of the antiquities of the town, under the guidance of Mr. John Bravender.—At 11 o'clock the Roman Amphitheatre.—Visit to the Roman Wall at Watermoor, the tesselated pavement at Mr. Brewin's and the pavement at the Barton.—Roman capitals and antiquities in the Abbey grounds.—Luncheon at 2·30.—Then to the Museum of "Corinium Antiquities."

Wednesday.—Excursion to Ranbury Rings.—Maisey Hampton Church and Fairford Church.—Lunch at Fairford.—Visit to Bibury Church.

Thursday.—Excursion to Trewsbury camp.—Akeman-street.—Crudwell Church.—Malmsbury Abbey Church and Cross, and Athelstan's Hall.—Charlton Park.—Ancient stones at Kemble, and visit to the Agricultural College of Cirencester.

Friday.—Excursion to Daglingworth Church.—Duntsbourne House.—Elkstone Church.—Lunch at Birdlip Hill.—Return by Brimpsfield Church and Castle, Miserden Church, and Edgworth.

Saturday.—Visit to the newly-discovered Roman villa at Chedworth.—Return to Fossbridge to lunch.—Examination of Chedworth Church.—Calmsden Wayside Cross, and North Cerney Church.

Evening meetings each day (except Monday), at the Assembly Rooms, for the reading of papers and discussions.

SEWERING WOLVERHAMPTON.

A WORK of great importance to the borough of Wolverhampton has been formally begun by Alderman Hawkesford, the chairman of the sewage committee of the corporation, laying, at the Antherley Junction, certain of the masonry necessary to the carrying out of the system of sewerage by which that town is henceforth to be drained, at an estimated cost of 40,000*l*. The whole of the sewage of the borough is to be taken into one outfall. For utilisation, the Barnhurst Estate of Mr. Hellier, consisting of somewhat over 283 acres, was bought for 28,000*l*.; and two fields, comprising over nine acres, were purchased on the west side of the canal, and immediately adjoining the Shrewsbury Railway, for the purpose of constructing the outfall sewer and filter-beds, and as a communication between the canal and the Barnhurst Estate. The nine acres were an addition to the work upon which the 40,000*l*. were estimated, and the price of "The Barnhurst" is not included in that larger sum. But there is every reason to conclude that when the estate has been brought fairly under irrigation, the rent will be sufficient to meet the outlay under that head.

RAILWAY MATTERS.

THE two last girders of the viaduct across the Solway Firth, which forms the chief engineering work on the Solway Junction Railway, have been laid by Mr. Brogden, of Ulverstone, the chairman of the directors, in the presence of the engineers and leading promoters of the undertaking. The bridge is 1,940 yards in length, and, with its sea embankments at each end, forms a road across the sea nearly two miles in length. About 1,800 tons of wrought-iron and 2,900 tons of cast-iron have been used in its construction. The bridge is formed upon iron piles screwed and driven into the subsoil. The foundations proved better than had been anticipated, and the work is said to be one of great solidity. This railway bridge will form a new connecting link between England and Scotland, and will provide a short route for the rich iron ore of Cumberland to the Scottish iron masters.

An Act has just passed through Parliament for the making of a tramway in the town of Street. This is the first instance where Parliament has sanctioned the construction of a tramway along a high road, and is, therefore, considered an important precedent. The cost of making it, as estimated by the engineer, Mr. Hamilton Fulton, is 3,800*l*. per mile. By its completion all the material facilities of a railway will be secured, and if such tramways can be generally constructed throughout the country for the sum estimated by Mr. Fulton, they will probably be adopted, and so save a considerable outlay in horse-power and in the expense of the wear and tear of the road, and doubtless will become valuable feeders to the railways.

A Mr. Kerr, of Edinburgh, has invented a reflector for a locomotive, by means of which the engineer is able to see the rear of his train, the conductor, and all who are either getting on or off, without moving from his seat. It can be arranged for any length of train by simply changing the angle of reflection. It has been tried on the Jeffersonville-road, and pronounced to be a success in every respect.

* Has previously received a Telford Medal.

A NEW PLAN FOR STATING ADDRESSES.

SIR,—If the following plan were adopted, as it might be, all over the world, it would save much trouble and inconvenience with regard to communication between persons living at different parts of a town, country, or the world.

It is simply to mark, in towns, on all streets running east and west, or nearly so, the minutes and seconds of longitude; in those running north and south, of latitude, in their regular succession, from one to sixty, and upon each door a figure representing the number of thirds of latitude and longitude.

In the open country, the degrees and minutes would suffice in their proper places, and the latitude or longitude, in degrees, minutes, seconds, and thirds, on every guide-post or milestone. This would soon be learned and easily understood, and would make it much easier for letter-carriers and others to find their way in large towns; besides which it would educate the people in the science of geography much better than half the books written on that subject.

In London the figures would run in regular succession from Bow to Tyburn; and wherever a person's address might be: for example,

6′ 31″ 15‴ W.

51° 3′ 9″ 45‴ N.

it would be perfectly easy to trace it out without asking the way, or requiring the name of the street or the number of the house.

A second of latitude is about 101 ft., and of longitude about 62 ft., in the parallel of London.

WALTER SCARGILL.

BLOOD PRODIGIES.

SOMETIMES, during the hottest weather of Midsummer, bread, paste, meat, &c., and a few other substances, are liable to become suddenly covered with a vivid carmine stain, exactly resembling arterial blood. Only a day or two ago, a pot of paste made for me in the evening became, during the night, coated with this brilliant crimson parasite; once or twice before I have observed it during the hottest days of July, and each previous time on bread, first appearing as a blood-red spot, and rapidly spreading over a large surface. I have tried to cultivate it, but without success, as it appears to require some peculiar state of the atmosphere, moist air at once destroying it. It may probably have been observed by other readers of the *Builder*; if so, it may be at once known by its *vivid crimson hue*. Its growth is very rapid, and its occurrence most capricious: it is of great interest, as affording in itself a clear explanation of the many apparently well-authenticated instances of "bleeding hosts," and of wafers used at the sacrifice of the Mass being suddenly blood-stained or transformed into real flesh and blood. The persecution of the Jews in the thirteenth century, at Rotil, near Frankfort, when 10,000 were murdered, is said to have been caused by some Jews "torturing" a host till it bled. The plant itself is little understood, and is at times referred to as an alga, or water-plant, but it probably belongs to the fungus tribe.

Every reader of the *Builder* must have observed claret-coloured gelatinous patches near old walls in damp places; they look very nasty, are seldom bright in colour, and have been compared to the dregs of port wine: these patches often grow on the ground near walls, creep up the mortar and adhere to the bricks, and look like a coating of dirty red jelly. To this plant many old writers referred when describing omens of fearful presage in blood issuing from the ground, trickling down walls, &c. It is a common alga (*Palmella cruentus*).

Allied to the latter are the large lumps of quivering green jelly (*Nostoc commune*), which are sometimes strewed in such abundance along paths and grassy roadsides in the autumn, and of which no traces were to be seen an hour or so before. They come up after showers, often in abundance, and in large trembling sticky masses. Country-folk call them "fallen stars" (!), and more aptly, "witches' butter." W. G. S.

THAMES EMBANKMENT STOCK-TAKING.

SIR,—The following is suggestive.

Southern Embankment. — From Gun-House-alley, near Vauxhall Bridge, to Westminster Bridge.—Of this contract 136,000*l*. remain to be done. The progress during the twelve months ending June 30, 1868, was 43,220*l*.

Northern Embankment, Contract No. 1.—From Westminster Bridge to Somerset House.—Of this contract 65,000*l*. remain to be done. The progress during the twelve months ending June 30, 1868, was 68,800*l*.

Northern Embankment, Contract No. 2.—From Somerset House to east end of Temple Gardens. This contract is finished.

Northern Embankment, Contract No. 3.—From east end of Temple Gardens to Blackfriars Bridge.—This contract was let on June 19 to the gentleman who has the Southern Embankment contract. It is to be finished in a year. Amount of contract 126,500*l*. JASPER.

LONGDON AND ELDERSFIELD DRAINAGE.

SIR,—Can you inform me why the Longdon and Eldersfield drainage contract has been given to a Mr. Field, when such name did not appear in the list of those who tendered, as quoted in your publication of 27th of June last. ONE WHO TENDERED.

"ENGINEERING FIELD WORK."

WE are much obliged for your notice of our book by W. D. Haskoll, but wish to remark that "Engineering Field Work," vol. i., just published, is a second edition of that work, published by us in 1858, revised and re-written, with some parts, that are not now required, omitted, and new matter added. We think it ought to be known that while we were preparing this second edition, Mr. Lockwood published his work on "Land and Marine Surveying." We are induced to mention this from your saying, the almost twin books simultaneously appeared. Of course ours was the first book, from having, as we before said, been published (that is, the first edition) ten years ago; so if there is any copying done *by* the author, it must have been done from our book into "Land and Marine Surveying." We cannot help adding, if our positions had been *reversed*, and Mr. Haskoll had brought this work to us, we would not have published it, knowing he had already written a work on the subject, which work was published by us ten years ago (1858).

ATCHLEY & Co.

UNAUTHORISED GAS COMPANIES.

VICE-CHANCELLOR MALINS has decided a point of considerable importance affecting water and gas companies. The matter arose out of the proceedings of two rival gas companies at Cambridge, and the principal question was, whether one of those companies, having no Act of Parliament, could be restrained by injunction from opening streets and roads for the purpose of laying down pipes and mains. The feature of the case, however, was the expression of the Vice-Chancellor's strong dissent from the decision of Lord Chancellor Cranworth and Lord Justice Turner in a well-known case, The Attorney-General *v.* The Sheffield Gas Company, which case, the Vice-Chancellor said, was cited before him about once a fortnight. He was surprised that two learned judges should have come to the conclusion that the general unlimited license exercised by

as unauthorised company to break up the streets of a great town like Sheffield was not such a nuisance as called for the interference of that Court. It was afterwards proved by a decision in the Court of Queen's Bench that it was a nuisance, yet that decision of the two learned Judges was held to be the law in all analogous cases. He (the Vice-Chancellor) was glad to have an opportunity of expressing his strong dissent from that decision, and his assent to the opinion of Lord Justice Knight Bruce, who differed from the opinion of his two learned brethren. So far as the matter before him was concerned, in so far as the Sheffield case applied to it, the matter was overruled by a recent decision in the Court of Queen's Bench, and he therefore warned the defendant company that they were committing a nuisance and could not proceed with their works without an Act of Parliament. He should, after the bill had been amended to meet a collateral point, grant an injunction against the defendant company.

ELECTRO-TELEGRAPHIC PROGRESS.

THE Atlantic Telegraph promises, should no disaster occur, to become one of the most remunerative undertakings of modern times. At the recent meeting of the shareholders a dividend at the rate of 8 per cent. for the nine months ending April last was declared, and from the statement of Mr. Cyrus Field it is likely that an increased dividend will be declared at the next meeting. The receipts under the reduced tariff are more by 100*l.* a day than they were previously, and it is probable that a further reduction will shortly take place. Under the 25*l.* tariff the receipts were 505*l.* per day; under the 10*l.* they were 579*l.*; and under the five guineas, 693*l.* Mr. Field stated that the company was in a position to do six times the amount of business it is now doing without adding a shilling to the expense.

Towards the close of the banquet given to Mr. Field, it was announced that telegraphic (one might almost say magical) messages addressed to the chairman (the Duke of Argyll) had just been received from America, in response to two of those sent by his grace during the evening:—

"From H. Seward, in the name of his Excellency Andrew Johnson, President of the United States, Washington.—Your salutations to the President from the banqueting-hall at Willis's have been received. The dinner-hour here has not arrived: it is only five o'clock; the sun is yet two hours high. When the dinner-hour arrives the president will accept your pledge of honour to our distinguished countrymen, Cyrus W. Field, and will cordially respond to your Highland aspiration for perpetual union between the two nations."

From Mr. Cyrus Field's daughter, in acknowledgment of the duke's congratulations:—

"New York, 4·5 p.m.—I thank you most sincerely for the kind words you have spoken of my father, causing me to feel that we are friends, although our acquaintance is thus made across the sea and in a moment of time."

From San Francisco the following telegram was despatched to Mr. Cyrus Field:—

"The Governor of California presents his compliments and congratulations."

The Governor of Oregon telegraphed as follows:—

"The people of Oregon salute you as the world's benefactor, and offer you their hand across the waters as a token of their high appreciation of the services which you have rendered to mankind. Let our kindest wishes in your behalf be our representative at your meeting."

The Governor-General of Cuba also forwarded a reply to the Duke of Argyll.

METROPOLITAN BUILDING ACT AND EXEMPTIONS CLAIMED BY RAILWAY COMPANIES.

District Surveyor of Kensington v. *Kelk, Waring, & Lucas.*—Professor Donaldson, as district surveyor, summoned the defendants, under clause xli., for neglecting to give notice of underpinning the external wall of 18, Cromwell-place, which they were carrying out in connexion with the retaining wall of the Underground Metropolitan Railway Company, at the distance of about 2 yards from the said retaining wall.

The defendants pleaded that they were contractors under the railway company, and consequently exempt under Part 1 of the Building Act; that they had purchased the premises in question; and that the Act of the Company, cap. lxxxv., of 1867, sec. 22, gave them powers to underpin houses and buildings within 100 ft. of their railways.

The district surveyor, in reply, contended that it was not sufficient that the premises in question should belong to, but should be used for the purposes of the railway company, which did not appear to be the case, as a mere building operation could not be so interpreted; and he quoted the case of Tolley *v.* the same parties, as reported in the *Builder* of February 8th, 1868, and decided by Mr. Arnold against the defendants. In regard to the power of underpinning granted by the Act of 1867, it would be seen that in the preamble the following words occur:—

"And whereas it has been found, in the construction of the railways under the powers of the Acts already obtained by the company, that in many instances the works of the company interfere, or threaten to interfere, with the stability of the buildings, which are *not necessary for the purposes of the company*, and the safety of which might be easily secured without permanent interference with the occupation thereof, and it is expedient that the powers hereinafter contained should be granted to the company for securing the stability of such buildings, subject, nevertheless, to the restrictions hereinafter also contained."

Therefore as these premises were purchased for merely enabling the company to carry out their works, by underpinning this building, which, in the words of the preamble, was "not necessary for the purposes of the company," the exemption clause did not apply to this case; and to constitute their exemption, the buildings must not only *belong to*, but *be used for the purposes of the Railway*.

The magistrate, Mr. Self, held that the defendants ought to have given notice.

MAREZZO MARBLE.

THE entrance-hall of the House of the Society of Arts, in the Adelphi, has been lined from floor to ceiling, including skirting, wall-covering, and cornice, with this new material, Marezzo Marble. It is somewhat similar in appearance to Scagliola, as we have had occasion to observe when describing it on a previous occasion, but its application appears to be more extensive: it takes a good polish, and is said to be moderate in cost.

Its basis is cement. The manufacture of the material in the form of slabs is simple. The veining of the stone intended to be represented is carefully copied on a sheet of glass, and of course dried. On this prepared surface is poured the cement, coloured to the tint required; and the whole, when dry, is removed from the glass, and polished in the usual way. The markings extend some depth, for if the surface be chipped they are still apparent in the substance of the material.

The decoration at the Society of Arts consists of panels of violet vein, with Bardiglio mouldings bordered by rich antique jasper, and with Egyptian green skirtings. The soffit of the arched doorway to the left of the entrance is executed in one piece, representing a beautiful formation of Bardiglio marble. The chimney-piece and ornamentation for the clock are included. The effect of the whole harmonizes with the Mosaic pavement, and the result is a very handsome apartment. We are disposed to think that some of the combinations of colour might have been more happily made, but that does not affect in any way the capabilities of the material.

CHURCH-BUILDING NEWS.

Easton.—The chief corner-stone of a new church (St. Gabriel's), at Upper Easton, has been laid. The site of the new building is close to Messrs. Leonard & Boult's colliery. It is intended to accommodate about 700 people. It will consist of a nave, transepts, and chancel, and will be built chiefly of bricks. The original cost was estimated at 2,100*l.*, but after the foundation had been dug it was discovered that the ground had been previously worked, and it was found necessary to build foundation walls of 18 ft. to 20 ft. in depth. The consequence is that the original estimate has been increased by about 400*l.*

Batheaston.—A vestry meeting has been held at Batheaston, the vicar presiding, when a report was presented from the church restoration committee announcing the completion of the work, and stating that a sum of upwards of 1,900*l.* had been raised towards the enlargement, reseating, lighting, &c., of the church, and that after paying all expenses a small balance remained in the hands of the treasurer. A subscription is now being raised under the auspices of Mrs. Rogers for the purpose of purchasing a new font.

Streatham.—The chief-stone of the new church of St. Peter and St. Paul, Leigham-road, has been laid. The church, to be built of coloured brick with Bath stone dressings, is from the designs of Mr. R. W. Drew. The length will be 80 ft., and the breadth 52 ft.; and the seats, 370 in number, will all be free. The cost is estimated at 4,000*l.* From its elevated position the new church will form a noticeable addition to the buildings which dot the hill. The tower will not be built with the first contract, and the church is planned so as to be capable of extension. Messrs. Perry, of Stratford, are the contractors; and Mr. J. Meadows clerk of the works.

Clifton (*Derbyshire*).—The foundation-stone of the chancel of Clifton church has been laid. At a vestry meeting held in the spring, it was resolved that, to make a chancel, an apse should be added at the east end of the church, and also that a vestry and organ-chamber should be built on the north side near the apse. Suitable designs having been provided by Messrs. Slater & Carpenter, of London, architects, Mr. W. Thorley, of Ellastone, was selected to be the builder. The proposed alterations, when completed, will afford an increased number of sittings for the congregation.

Birmingham.—The foundation stone of St. Anne's Church, Cato-street, Nechells, has been laid. The building is oblong on plan, and consists of nave, a small chancel, and north, south, and west galleries. The principal elevation is in Cato-street, where there will be a west gable, in which are three large lancet windows. There is also provision for a spire, to be built hereafter. A centre doorway from Cato-street opens into the body of the church, and there are side entrances leading to the galleries. The walls will be built entirely of brickwork, no stone being used in the church excepting for the steps and the font. The roof over the body of the church is of one span, the timbers being exposed to view. The building will be covered with tiles, and the church will be plastered inside. The entire cost, including galleries, will be 2,177*l.*, and the building will afford accommodation to 810 adults. Mr. J. A. Chatwin is the architect, and Mr. J. Briley the builder.

Yaxley.—The parish church of Yaxley, about two miles to the west of Eye, between Ipswich and Norwich, has been re-opened, after having undergone a restoration. The repair of the chancel devolved upon Sir E. C. Kerrison, the lay impropriator, and he determined to pull down and rebuild it. The tower has not been touched externally, and several cracks may be seen. The north wall of the nave is brick, and has been stuccoed, but in several places the plaster has fallen. The roof of the nave is of lead, and in the restoration nothing appears to have been done to it. The ceiling of the porch is groined, and has been restored. Both north and south walls of the chancel have been rebuilt of flint, with white stone dressings, but the east wall has been left. In the nave the walls have been re-plastered, the columns cleaned; for the pews solid oak benches, with carved poppy-head ends, have been substituted; the windows have been touched up, and the stonework of the two-light east window of the aisle restored. The nave is lighted by two clearstory windows, as well as by those in the south aisle. Here, as, indeed, throughout, the flooring is new, the passages being paved with Minton's encaustic tiles, those in the nave and aisle plain red, but in the chancel a pattern is formed. In both the north and south walls are two new two-light windows, filled with cathedral glass, with an edging of blue. The roof is of oak and is open, the principals springing from stone corbels. Mr. Blackburn, of London, was the architect; Mr. Rampling, of Eye, the builder; Mr. Vine, of Eye, did the stonework; Mr. Neale, of Eye, the plumbing and glazing; and Mr. Frost, of Watton, was the wood carver. The total cost of the restorations is said to be about 1,000*l.*

Enderby.—The church here, having been almost entirely rebuilt on an enlarged scale, has been consecrated and re-opened for Divine service. The edifice has been almost entirely rebuilt at the sole expense of Mr. Brook. The designs and plans for the building were provided by Mr. E. Birchnall, of Leeds, and he has adapted the style of the ancient church to the extended requirements. The contract for the building was taken by Mr. J. Firn, of Leicester. The church now consists of a nave of five bays, with side aisles, and a chancel of three bays. There is also a vestry added to the chancel, and an organ-chamber adjoining it. The windows are of geometrical form, with tracery, and are filled with different coloured glass. The roof is supported by clustered columns, with moulded arches in Bath stone and red coloured labels of Alton stone. The chancel window, which is of stained glass, contains the following subjects:—"The

Nativity," "The Entombment," and "The Ascension of Christ." The tracery is filled with cherubim and seraphim in the act of adoration, the *Agnus Dei* being the centre subject. The roof and seats are of deal. The tower, which as yet has undergone but little alteration in the exterior, but which it is now intended completely to restore, has been considerably altered in the interior. The tower-arch has been restored, and a small stained-glass window, with the figure of St. John the Baptist, and the beheading of St. John, as the subjects, has been placed there instead of the door, which originally opened into the tower. A new peal of five bells has been furnished, cast by Mr. Taylor, of Loughborough. The stone work has been executed by Mr. Firn; the woodwork by Messrs. Taylor & Son, Thurlaston; and the plumbing and gas-fitting by Mr. Alfred Adams, of Littlethorpe. The restoration of the church will cost over 5,000*l.*

Seal.—The new church on Seal Chart, erected at the expense of Mr. Horace Wilkinson, has been consecrated. The edifice is situated in the vicinity of a road leading in the direction of Seal Chart on the one hand, and Stone-street, &c., on the other. Mr. Constable was the builder of the church and a school connected with it.

St. Deny's, Southampton.—The new church at St. Deny's has been consecrated by the Bishop of Mauritius. The structure has been built in the Early English style, from designs furnished by Mr. Gilbert Scott, and the work has been carried out by Mr. Futcher, of Salisbury. The church is constructed of red brick, with Bath stone dressings. At present there is a nave, with chancel at the eastern end of a circular form, a north aisle, and north chancel, and doubtless the structure will remain in this condition till its enlargement is absolutely necessary, when a south aisle and chancel will be added. The contract for the work, as it exists at present, is about 5,000*l.* The church, we understand, will accommodate some 700 persons. The pews are of stained deal. The roof is also of stained wood. The principals supporting the roof rest on brackets, carved with designs characteristic of the style of architecture. The windows are plain quarry lights, but are arcaded. The doors also are arcaded. An anonymous donor offered to contribute 3,400*l.* towards the structure if an additional 3,000*l.* could be raised. 1,000*l.* more are still required.

Clifton, Bristol.—We are asked to say that the chancel of All Saints' is paved with tiles supplied by Mr. Godwin, of Lugwardine; not Minton's, as stated.

STAINED GLASS.

R. C. Church, Teignmouth, Devon.—A stained-glass window was placed in this church a few days ago, at the instance of Captain Keating, and containing in the centre opening the Crucifixion, and at the sides the figures of St. John and the Virgin Mary, upon diapered groundwork. In the tracery are the I. H. S. and ornaments. The work was executed by Messrs. Holland & Son, of Warwick.

Blidworth Church.—This church, which has for some time possessed a stained-glass window of the Nativity, the gift of Colonel Welfitt, has been further provided with one emblematical of practical Christian charity. It has been executed by M. M. Maréchal, of Metz.

Wilford Church (Nottingham).—The movement for erecting a window in this church to the memory of Henry Kirke White has, under the management of Mr. Davies, the rector, proceeded satisfactorily. A design for a stained-glass window, to be placed in the south side of the church, has been prepared by Messrs. A. & W. H. O'Connor, of London. The design, which is in two compartments, gives a representation (why we do not know) of the Star of Bethlehem; one compartment shows the Virgin and Child, and the other the Wise Men making their Offerings. Along the top of the window are figures of angels. The window is to be placed in the church in September next.

Kimbolton Church.—We are requested to state that Messrs. Lavers, Barraud, & Westlake produced the window already announced as having been placed in this church.

St. James's, Carlisle.—The decoration of the chancel of this church has now been completed, the small windows on each side of the apse having been filled with stained glass, corresponding in form and colouring with the window at the east end of the chancel which was put in previously to the opening of the church. The windows were designed and executed by Messrs. John Scott & Son, stained glass manufacturers, Carlisle. Each window is composed of one large panel, and contains in the centre a pictorial representation of an incident in sacred history, surrounded by a rose border on an azure and ruby ground. The subject of the left window is the raising of Jairus's daughter. The window on the right side of the apse contains a delineation of the youthful Saviour disputing with the doctors in the temple. The west window is large, and if it were also filled with stained glass, the strong light which streams through it would be softened, and a more pleasing effect would be produced. Two of the three stained glass windows in the chancel have been presented to the church by Mr. Nelson, of Murrell-hill House, and the third by Mrs. Nelson.

SCHOOL-BUILDING NEWS.

Stockport. — The corner-stone of Wesleyan day and Sunday schools, in the southern part of the town, has been laid. The building consists of three wings. The first, which is at the corner of Brentnall-street, its external dimensions being 74 ft. by 40 ft., is two stories high. The lower story is divided into numerous class-rooms, fitted up with galleries; the upper story being all one room, 25 ft. high, lighted at the sides by a large three-light transome window, and at each end by large seven-light transome windows, and fitted up with large galleries extending across the room. The second wing, which is adjoining and facing Wellington-road, 30 ft. by 17 ft., consists of the principal entrance vestibule, with a stone staircase for access to the large rooms above, with infants' class-room adjoining. The third wing is also two stories high, its external dimensions being 43 ft. by 25 ft., the lower story of which is to be used for the infants and the upper story as a lecture-room. The ground-floor of the school is elevated 4 ft. higher than the path. The style of architecture will be Tudor Gothic, faced round the principal elevations with bricks, embellished with stone quoins, mullions, and transomes, with moulded and sunk tracery heads. The principal gable of the wing will have a large projecting window, 20 ft. wide and 38 ft. high, the other elevations being carried out in a similar way. The contractors are Messrs. T. & W. Meadows, Heaton Norris; the architect is Mr. T. H. Allen, Stockport; and the probable cost of the buildings (including the fixtures, &c., and the land) will be about 3,600*l.*

Books Received.

The Life of George Stephenson and of his Son, Robert Stephenson: comprising also a History of the Locomotive. By SAMUEL SMILES. New edition, revised and enlarged. London. Murray.

THIS fresh edition of Mr. Smiles's capital volume on the Stephensons includes a new preface, in which the author gives a review of the progress of railways and railway traffic since the appearance of the volume in its original form ten years ago. As the author regards the present edition as probably the final one, he has taken pains to render it, by careful amendment and revision, worthy of public acceptance. It includes a history of the railway locomotive in its earlier stages, uniform with the early history of the steam-engine, given in vol. iv. of "Lives of the Engineers," and a fuller memoir than had yet appeared of Richard Trevithick, with a portrait of him. The volume contains an alternative title-page, as "Lives of the Engineers," vol. iii.

We may quote a passage from the conclusion of the preface, to show the number of persons now employed on railways in the United Kingdom, and the author's views of the present and prospective state of railway management:—

"A few words in conclusion as to the number of men employed in working and maintaining railways. According to Mr. Mills, 166,047 men and officers were employed in the working of 13,289 miles open in the United Kingdom in 1865, besides 53,923 employed on lines then under construction. The most numerous body of workmen is that of the labourers (81,284) employed in the maintenance of the permanent way. Being mostly picked men from the labouring class of the adjoining districts, they are paid considerably higher wages; and hence one of the direct effects of railways on the labouring population (besides affording them greater facilities for locomotion) has been to raise the standard of wages of ordinary labour at least 2*s.* per week in all the districts into which they have penetrated. The workmen next in number is that of the artificers (40,167) employed in constructing and repairing the rolling-stock; the porters (25,381), the plate-layers (12,901), guards and brakesmen (5,799), firemen (5,268), and engine-drivers (5,171). But besides the *employés* directly engaged in the working and maintenance of railways, large numbers of workmen are also occupied in the manufacture of locomotives and rolling-stock, and in providing the requisite materials for the permanent way. Thus, the consumption of rails alone averages nearly 400,000 tons a year in the United Kingdom alone; while the replacing of decayed sleepers requires about 10,000 acres of forest to be cut down annually and sawn into sleepers. Taking the various railway workmen into account, with their families, it will be found that they represent a total of about three-quarters of a million persons, or about one in fifty of our population, who are dependent on railways for their subsistence.

While the practical working of railways has, on the whole, been so satisfactory, the case has been very different as regards their direction and financial management. The men employed in the working of railways make it their business to learn it, and, being responsible, they are under the necessity of taking pains to do it well; whereas the men who govern and direct them are practically irresponsible, and may possess no qualification whatever for the office excepting only the holding of so much stock. The consequence has been much blundering on the part of these amateurs, and great loss on the part of the public. Indeed, what between the confused, contradictory, and often unjust legislation of Parliament, on the one hand, and the carelessness or incompetency of directors, on the other, many once flourishing concerns have been thrown into a state of utter confusion and muddle, until railway government has become a by-word of reproach.

And this state of things will probably continue until the fatal defect of Government by Boards—an extremely limited responsibility, or no responsibility at all—has been rectified by the appointment, as in France, of executives consisting of a few men of special ability and trained administrative skill, personally responsible to their constituents for the due performance of their respective functions. But the discussion of this subject would require a treatise, whereas we are now but writing a preface.

Whatever may be said of the financial mismanagement of railways, there can be no doubt as to the great benefits conferred by them on the public wherever made. Even those railways which have exhibited the most 'frightful examples' of scheming and financing, so soon as placed in the hands of practical men to work, have been found to prove of unquestionable public convenience and utility. And notwithstanding all the faults and imperfections that are alleged against railways have been admitted, we think that they must, nevertheless, be recognised as by far the most valuable means of communication between men and nations that has yet been given to the world."

Metal Work Trade-Book.

MESSRS. J. RATCLIFF & SONS, of Birmingham, have issued a catalogue of their "Mediæval Art Metal-Work," and claim to bring into greater use than others do the services of the sculptor and the chaser to assist in producing works of the character peculiar to the twelfth century. With much that is clever and original in the designs, they are for the most part not Mediæval in character. They are too spiky, and where not too spiky too "pretty." They had better put away the word Mediæval, and let their designs stand on their own merit,—which is considerable.

VARIORUM.

Mr. C. Roach Smith's "Collectanea Antiqua" (Parts III. and IV., vol. vi.), contains besides the biography of the late F. W. Fairholt already referred to, notices of the late Dawson Turner and Hudson Gurney. It is certainly sad that men like these should pass away, and be so soon lost sight of as they are. Some relative or friend should supplement what Mr. Smith, without special materials at command, has well and kindly written. The numbers of the "Collectanea" before us are altogether good ones.——Bernard Quaritch's "General Catalogue of Books, arranged in classes," 1868 (15, Piccadilly), is a portly volume of 1,130 pages, and contains the titles of many books of which it is desirable to know the whereabouts.——The *Popular Science Review* for July contains some very interesting papers, especially one on "The Study of Chemical Geology," by David Forbes, F.R.S.; one on "Animals between Birds and Reptiles," by Professor Huxley; and one on "The Great Eclipse of August 17th of this Year," by R. A. Proctor, F.R.A.S. —— "Iron Ship Building." With practical illustrations. By John Grantham, C.E., &c. Fifth edition, with supplement and index. London: Virtue & Co. 1868. This is an enlarged edition of an elaborately illustrated work, consisting mainly of engravings. The supplement traces the progress made in iron shipbuilding up to the present time.——"Observations and Suggestions on the Railways of the United Kingdom." By F. B.: Causton & Sons, 47, Eastcheap. The chief object of this pamphlet is to show how the railways may be immediately rendered more serviceable and beneficial to the public generally than they now are, and much more remunerative to their proprietors. This, the author rightly thinks, would be done simply

by low fares and charges, say "for second-class to a rate of one penny for every five miles, and of third-class to one halfpenny for every five miles:" for goods and parcels also the rates to be largely reduced,—parcels under 14 lb. say, for one penny each, and proportionally for greater weights. But why should not first-class passenger fares be also reduced? Second and third class carriages ought to be improved and made more safe, as by means of cheap stuffing or cushioning. Why should the less wealthy classes be less safely conveyed than the more wealthy, or why should they be thus forced to pay more than they can afford? Passengers who can afford first-class tickets are not so placed under the screw to force higher fares out of *them*, although they can as a class far better afford it.

Miscellanea.

BARNSLEY.—At a recent meeting of the local Board of Guardians the clerk read a letter from the Poor-law Board on the subject of the workhouse hospital accommodation, recommending the guardians to take into consideration as early as practicable the erection of an entirely new infirmary, detached from the main building. A committee was appointed to take the matter into consideration, with power to consult an architect and report to a future meeting of the Board.

PRESENTATION TO BISHOP SELWYN.—A few old New Zealand colonists, resident in England, have presented to the Bishop of Lichfield, who has now sailed for New Zealand, a pastoral staff. The staff, executed by Messrs. Cox & Son, of London, is of massive silver, with the top crocketed and jewelled, the knop below the crook pinnacled and chased, and the stem of polished ebony with silver bulb and base. An address was read to the bishop on behalf of the donors by Archdeacon Paul, prebendary of Lincoln.

IMPROVEMENTS IN HIGH HOLBORN.—The crossing from Gray's Inn-road to the south side of Holborn having been rendered highly dangerous to pedestrians since the removal of Middle-row, and consequent widening of the carriage-road for the increased traffic, the Metropolitan Board of Works have caused a cast-iron gas-lamp pillar to be erected in High Holborn, at its junction with the carriage-road of Gray's Inn-road. The pavement around the pillar is raised, so as to afford a place of refuge to persons crossing; this is also inclosed with iron posts, in order to prevent carriages from being driven on the raised pavement. At the Holborn viaduct workmen are actively engaged in filling up the hollows between the arches with gravel dredged from the river, and dry brick rubbish, so as to form a solid foundation, preparatory to being paved with cubic blocks of granite. At the western terminus of the viaduct a pillar is to be erected with brackets, each supporting a lantern with four burners. The place in which the pillar is to stand is of large diameter, perfectly circular, and is intended to afford a place of safety to foot-passengers crossing the main thoroughfare.

GENERAL BUILDERS' ASSOCIATION.—The annual meeting of this Association was held in St. George's Hall, Bradford. Mr. Whiteley presided. The secretary read the reports of sub-committees on the subjects of working rules, the establishment of a builders' fire insurance, the amalgamation of the labour registration offices established by the Association in various towns, and those of the free labour registration of London, and other matters. A lengthy discussion arose on the proposition to approve the working rules drawn up by the sub-committee appointed for that purpose. The first of these rules provides that payment by the hour shall be adopted by all members of the Association on and after the 1st May, 1869, and that due notice of this be given to the operatives. Others of the rules provide that a court of arbitration between employers and employed be formed, and that the rule restricting the use of worked stone be abolished. A very strong feeling in favour of the adoption of the rules was manifested, but it was finally resolved that the report of the sub-committee be referred to the branch associations, and that they send delegates to the September meeting, with power to vote upon the question.

"THE SONG OF THE SHIRT."—The sitting female figure by Mr. Marshall Wood, which under this title attracted deserved attention in the Paris International Exhibition, is now on view in the gallery belonging to Messrs. H. Graves & Co., Pall-mall, and will well repay a visit. The attenuated form, and the care-worn face of the poor shirtmaker are represented with grace as well as touching truth.

BARK-CUTTING MACHINE.—In an article on the Sawmill at Cummertrees, the *Annan Observer*, says:—"The most serviceable improvement that has been introduced into their works by Messrs. Matthews & Boyd, is the bark-cutting machine, invented by Mr. Jonathan Thompson, engineer, Penrith, which can, with only three men to attend it, do the work of forty men and sixty women in the ordinary way by hand."

FIRE ON THE MOORS.—By the fire in Yorkshire nearly 4,000 acres of moorland have been left black and desolate, with probably scarcely a living bird, or animal, or vegetable, excepting the largest trees, over the wide expanse. The grouse and rabbits which abound on these moors have been destroyed, and sheep grazing thereon have in some instances perished. A fire somewhat similar has been burning for the last few days on Chat Moss. The fire has passed over a considerable area.

THE GREAT DOME AT WASHINGTON. — The dome of the Capitol at Washington is the most ambitious structure in America. It is 108 ft. higher than the Washington monument at Baltimore, 68 ft. higher than that of Bunker Hill, and 28 ft. higher than the Trinity Church spire at New York. It is the only considerable dome of iron in the world. It is a vast hollow sphere of iron, weighing 8,200,000 lb. Directly over your head is a figure in bronze, "America," weighing 14,985 lb.—*New York Observer.*

THE ART TREASURES OF WALES.—An Exhibition of Works of Art is being got up at Ruthin, Denbighshire, North Wales, to commence on the 4th of August, and remain open to the public for a month. Mr. Cornwallis West, of Ruthin Castle, is an active promoter of the undertaking; while Mr. Chaffers, the collector, is principal superintendent. The promoters, who in the new townhall at Ruthin have a very convenient set of apartments for the proper display of the collection, are very sanguine of success.

BROUGHAM AND BISMARK.—It is said that the charming château inhabited by the late Lord Brougham at Cannes, is to become the residence of no less a personage than the statesman Herr von Bismark. The story goes that General Bulow, who had just concluded a bargain in the name of the illustrious minister, set to reading the famous distich of Ovid inscribed on the colonnade:—

> "Inveni portum; spes et fortuna valete;
> Sat me lusistis, ludite nunc alios."

A young gentleman who accompanied him asked, waggishly, if this was to become the motto of the Prussian minister.

THE HOLY SEPULCHRE.—A letter from Jerusalem in the *Moniteur* says:—"The works for the reconstruction of the cupola of the Holy Sepulchre, which have been carried on with extreme rapidity, appear to be approaching their termination. At the end of last year the iron ribs were completed, and the lantern placed on the summit. An idea could then be formed of the elegant proportions of the new dome. The previous edifice, being too flat, had a heavy appearance. The present cupola, being about 6 ft. higher, and surmounted with a cross, rises more conspicuously above the surrounding buildings."

THE BIRMINGHAM WORKHOUSE SCHOOLS.—At a recent meeting of the local guardians, Mr. Biddle said the Poor Law Board's architect and medical examiner of plans had conceded all that the guardians asked in reference to the workhouse schools, except that they wished the building to be a little wider and longer.—Mr. Hawley: And to have a large bath, to teach the boys to swim.—The architects (Messrs. Martin & Chamberlain) reported that they had had two interviews with Dr. Smith, the medical examiner of plans, and Mr. Savage, the architect to the Poor Law Board, with reference to the plans of the proposed new schools for 300 boys. Mr. Hawley moved that the plans, modified in the manner indicated in the report, be sent to the Poor Law Board for their seal. This was agreed to.

CLEAN ROADS.—R. T. writes:—"It is computed that three-fourths of the dirt on the London stones arise from horse-dung, either as pulverized dust or mud. It causes much damage and annoyance, ill-health, and ophthalmia. To remedy the above, I would hook a wire basket with hinged front on the vehicle immediately behind the animal, so that the upward motion of the tail would open the front (by means of a thong fixed to the crupper) to receive the droppings, to be emptied into parish receptacles if necessary. All shop sweepings ought to be thrown into the dust-bin. I hope no squeamisher will expect an apology for this dealing with Nature."

THE PROPOSED PAXTON MEMORIAL AT LEIGHTON BUZZARD.—The members of the Leighton Buzzard Working Men's Mutual Improvement Society have had a meeting at the Cedars, the residence of Mr. J. D. Bassett, where they presented an address to Lord Charles J. F. Russell, advocating his lordship's suggestion, made at the inauguration of the recent industrial exhibition, to establish in this town an educational and popular institute, to be associated with the name of the late Sir Joseph Paxton, as we have before mentioned. It was resolved in course of the proceedings, "that the proposed memorial shall be called 'The Paxton Institute,' and shall be devoted to the advantage of the working-classes and the inhabitants of the locality generally." A committee was appointed to carry into effect the proposed Paxton Institute.

PUBLIC MUSEUMS AND LIBRARIES.—A meeting has been held at the Society of Arts for the purpose of urging upon the Government "the duty of placing upon a footing worthy of national institutions the public museum of inventions and free scientific library connected with the Patent Office." The objects of the association by which the meeting was convened are the opening of the national collections on week-day evenings, and the promotion of the adoption of the Free Libraries and Museums Act. Professor Leone Levi occupied the chair, and was supported by a considerable number of gentlemen interested in promoting the extension of public museums and libraries. Appropriate resolutions were agreed to, including one authorizing the Chairman to petition Parliament through Mr. Layard and Lord Lichfield.

THE LIVERPOOL ARCHITECTURAL SOCIETY AT WYNNSTAY.—The annual excursion of the Liverpool Architectural and Archæological Society took place on Saturday, Wrexham and the neighbouring locality of Wynnstay being the scene of the Society's visit. There were about thirty in the party. After their visit to Wynnstay they partook of dinner at the Wynnstay Arms Hotel, Wrexham. The chair was occupied by Mr. F. Horner, the president, and the vice-chair by Mr. William Hay, one of the vice-presidents; and the company included the Mayor of Wrexham, Mr. Walker. Afterwards the party visited the parish church of Wrexham, and several ascended the tower, from the summit of which a most extensive view of the surrounding country is obtained. Shortly before ten o'clock the visitors left the Wrexham station, and returned by rail to Liverpool.

THE COST OF THE NEW WORKHOUSE FOR SOUTHAMPTON.—At a recent meeting of the local Guardians, a letter was read from the Poor Law Board as to the letter of the Guardians forwarding a statement to show the manner in which the 18,800*l.* borrowed by the Guardians for the erection of the new workhouse had been expended, and also a statement showing the purposes for which the further sum of 7,000*l.* was required. The estimated cost of 4,689*l.* for extra works seemed to the Poor Law Board to be rather large, being nearly 23 per cent. on the amount of the original contract. Before determining what further amount they should authorise the Guardians to borrow, they requested some general particulars of the several items. The Deputy-President thought that the Poor Law Board were not warranted in asking for such information, and that the architect should not be called upon to go into an explanation of detail in matters which should rest for the present entirely with himself and the builder. A committee, however, was appointed to consider the letter, and to furnish the information required by the Poor Law Board. The architect mentioned that there had been matters in connexion with the foundations of the workhouse building that could not be foreseen, and which had tended very considerably to raise the expenses which had been incurred for extras.

Nativity," "The Entombment," and "The Ascension of Christ." The tracery is filled with cherubim and seraphim in the act of adoration, the *Agnus Dei* being the centre subject. The roof and seats are of deal. The tower, which as yet has undergone but little alteration in the exterior, but which it is now intended completely to restore, has been considerably altered in the interior. The tower-arch has been restored, and a small stained-glass window, with the figure of St. John the Baptist, and the beheading of St. John, as the subjects, has been placed there instead of the door, which originally opened into the tower. A new peal of five bells has been furnished, cast by Mr. Taylor, of Loughborough. The stone work has been executed by Mr. Firn; the woodwork by Messrs. Taylor & Son, Thurlaston; and the plumbing and gas-fitting by Mr. Alfred Adams, of Littlethorpe. The restoration of the church will cost over 5,000*l*.

Seal.—The new church on Seal Chart, erected at the expense of Mr. Horace Wilkinson, has been consecrated. The edifice is situated in the vicinity of a road leading in the direction of Seal Chart on the one hand, and Stone-street, &c., on the other. Mr. Constable was the builder of the church and a school connected with it.

St. Deny's, Southampton.—The new church at St. Deny's has been consecrated by the Bishop of Mauritius. The structure has been built in the Early English style, from designs furnished by Mr. Gilbert Scott, and the work has been carried out by Mr. Futcher, of Salisbury. The church is constructed of red brick, with Bath stone dressings. At present there is a nave, with chancel at the eastern end of a circular form, a north aisle, and north chancel, and doubtless the structure will remain in this condition till its enlargement is absolutely necessary, when a south aisle and chancel will be added. The contract for the work, as it exists at present, is about 5,000*l*. The church, we understand, will accommodate some 700 persons. The pews are of stained deal. The roof is also of stained wood. The principals supporting the roof rest on brackets, carved with designs characteristic of the style of architecture. The windows are plain quarry lights, but are arcaded. The doors also are arcaded. An anonymous donor offered to contribute 3,400*l*. towards the structure if an additional 3,000*l*. could be raised. 1,000*l*. more are still required.

Clifton, Bristol.—We are asked to say that the chancel of All Saints' is paved with tiles supplied by Mr. Godwin, of Lugwardine; not Minton's, as stated.

STAINED GLASS.

R. C. Church, Teignmouth, Devon.—A stained-glass window was placed in this church a few days ago, at the instance of Captain Keating, and containing in the centre opening the Crucifixion, and at the sides the figures of St. John and the Virgin Mary, upon diapered ground-work. In the tracery are the I. H. S. and ornaments. The work was executed by Messrs. Holland & Son, of Warwick.

Blidworth Church.—This church, which has for some time possessed a stained-glass window of the Nativity, the gift of Colonel Welfitt, has been further provided with one emblematical of practical Christian charity. It has been executed by M. M. Maréchal, of Metz.

Wilford Church (Nottingham).—The movement for erecting a window in this church to the memory of Henry Kirke White has, under the management of Mr. Davies, the rector, proceeded satisfactorily. A design for a stained-glass window, to be placed in the south side of the church, has been prepared by Messrs. A. & W. H. O'Connor, of London. The design, which is in two compartments, gives a representation (why we do not know) of the Star of Bethlehem; one compartment shows the Virgin and Child, and the other the Wise Men making their Offerings. Along the top of the window are figures of angels. The window is to be placed in the church in September next.

Kimbolton Church.—We are requested to state that Messrs. Lavers, Barraud, & Westlake produced the window already announced as having been placed in this church.

St. James's, Carlisle.—The decoration of the chancel of this church has now been completed, the small windows on each side of the apse having been filled with stained glass, corresponding in form and colouring with the window at the east end of the chancel which was put in previously to the opening of the church. The windows were designed and executed by Messrs. John Scott & Son, stained glass manufacturers, Carlisle. Each window is composed of one large panel, and contains in the centre a pictorial representation of an incident in sacred history, surrounded by a rose border on an azure and ruby ground. The subject of the left window is the raising of Jairus's daughter. The window on the right side of the apse contains a delineation of the youthful Saviour disputing with the doctors in the temple. The west window is large, and if it were also filled with stained glass, the strong light which streams through it would be softened, and a more pleasing effect would be produced. Two of the three stained glass windows in the chancel have been presented to the church by Mr. Nelson, of Murrell-hill House, and the third by Mrs. Nelson.

SCHOOL-BUILDING NEWS.

Stockport.—The corner-stone of Wesleyan day and Sunday schools, in the southern part of the town, has been laid. The building consists of three wings. The first, which is at the corner of Brentnall-street, its external dimensions being 74 ft. by 40 ft., is two stories high. The lower story is divided into numerous class-rooms, fitted up with galleries; the upper story being all one room, 25 ft. high, lighted at the sides by a large three-light transome window, and at each end by large seven-light transome windows, and fitted up with large galleries extending across the room. The second wing, which is adjoining and facing Wellington-road, 30 ft. by 17 ft., consists of the principal entrance vestibule, with a stone staircase for access to the large rooms above, with infants' class-room adjoining. The third wing is also two stories high, its external dimensions being 43 ft. by 25 ft., the lower story of which is to be used for the infants and the upper story as a lecture-room. The ground-floor of the school is elevated 4 ft. higher than the path. The style of architecture will be Tudor Gothic, faced round the principal elevations with bricks, embellished with stone quoins, mullions, and transomes, with moulded and sunk tracery heads. The principal gable of the wing will have a large projecting window, 20 ft. wide and 38 ft. high, the other elevations being carried out in a similar way. The contractors are Messrs. T. & W. Meadows, Heaton Norris; the architect is Mr. T. H. Allen, Stockport; and the probable cost of the buildings (including the fixtures, &c., and the land) will be about 3,600*l*.

Books Received.

The Life of George Stephenson and of his Son, Robert Stephenson: comprising also a History of the Locomotive. By SAMUEL SMILES. New edition, revised and enlarged. London. Murray.

THIS fresh edition of Mr. Smiles's capital volume on the Stephensons includes a new preface, in which the author gives a review of the progress of railways and railway traffic since the appearance of the volume in its original form ten years ago. As the author regards the present edition as probably the final one, he has taken pains to render it, by careful amendment and revision, worthy of public acceptance. It includes a history of the railway locomotive in its earlier stages, uniform with the early history of the steam-engine, given in vol. iv. of "Lives of the Engineers," and a fuller memoir than had yet appeared of Richard Trevithick, with a portrait of him. The volume contains an alternative title-page, as "Lives of the Engineers," vol. iii.

We may quote a passage from the conclusion of the preface, to show the number of persons now employed on railways in the United Kingdom, and the author's views of the present and prospective state of railway management:—

"A few words in conclusion as to the number of men employed in working and maintaining railways. According to Mr. Mills, 166,047 men and officers were employed in the working of 13,289 miles open in the United Kingdom in 1865, besides 53,923 employed on lines then under construction. The most numerous body of workmen is that of the labourers (81,284) employed in the maintenance of the permanent way. Being mostly picked men from the labouring class of the adjoining districts, they are paid considerably higher wages; and hence one of the direct effects of railways on the labouring population (besides affording them greater facilities for locomotion) has been to raise the standard of wages of ordinary labour at least 2*s*. per week in all the districts into which they have penetrated. The workmen next in number is that of the artificers (40,167) employed in constructing and repairing the rolling-stock; the porters (25,381), the plate-layers (12,901), guards and brakesmen (6,799), firemen (5,588), and engine-drivers (5,171). But besides the *employés* directly engaged in the working and maintenance of railways, large numbers of workmen are also occupied in the manufacture of locomotives and rolling-stock, and in providing the requisite materials for the permanent way. Thus, the consumption of rails alone averages nearly 400,000 tons a year in the United Kingdom alone; while the replacing of decayed sleepers requires about 10,000 acres of forest to be cut down annually and sawn into sleepers. Taking the various railway workmen into account, with their families, it will be found that they represent a total of about three-quarters of a million persons, or about one in fifty of our population, who are dependent on railways for their subsistence.

While the practical working of railways has, on the whole, been so satisfactory, the case has been very different as regards their direction and financial management. The men employed in the working of railways make it their business to learn it, and, being responsible, they are under the necessity of taking pains to do it well; whereas the men who govern and direct them are practically irresponsible, and may possess no qualification whatever for the office excepting only the holding of so much stock. The consequence has been much blundering on the part of these amateurs, and great loss on the part of the public. Indeed, what between the confused, contradictory, and often unjust legislation of Parliament, on the one hand, and the carelessness or incompetency of directors, on the other, many once flourishing concerns have been thrown into a state of utter confusion and muddle, until railway government has become a by-word of reproach.

And this state of things will probably continue until the fatal defect of Government by Boards—an extremely limited responsibility, or no responsibility at all—has been rectified by the appointment, as in France, of executives consisting of a few men of special ability and trained administrative skill, personally responsible to their constituents for the due performance of their respective functions. But the discussion of this subject would require a treatise, whereas we are now but writing a preface.

Whatever may be said of the financial mismanagement of railways, there can be no doubt as to the great benefits conferred by them on the public wherever made. Even those railways which have exhibited the most 'frightful examples' of scheming and financing, so soon as placed in the hands of practical men to work, have been found to prove of unquestionable public convenience and utility. And notwithstanding all the faults and imperfections that are alleged against railways have been admitted, we think that they must, nevertheless, be recognised as by far the most valuable means of communication between men and nations that has yet been given to the world."

Metal Work Trade-Book.

MESSRS. J. RATCLIFF & SONS, of Birmingham, have issued a catalogue of their "Mediæval Art Metal-Work," and claim to bring into greater use than others do the services of the sculptor and the chaser to assist in producing works of the character peculiar to the twelfth century. With much that is clever and original in the designs, they are for the most part not Mediæval in character. They are too spiky, and where not too spiky too "pretty." They had better put away the word Mediæval, and let their designs stand on their own merit.,—which is considerable.

VARIORUM.

Mr. C. Roach Smith's "Collectanea Antiqua" (Parts III. and IV., vol. vi.), contains besides the biography of the late F. W. Fairholt already referred to, notices of the late Dawson Turner and Hudson Gurney. It is certainly sad that men like these should pass away, and be so soon lost sight of as they are. Some relative or friend should supplement what Mr. Smith, without special materials at command, has well and kindly written. The numbers of the "Collectanea" before us are altogether good ones.——Bernard Quaritch's "General Catalogue of Books, arranged in classes," 1868 (15, Piccadilly), is a portly volume of 1,130 pages, and contains the titles of many books of which it is desirable to know the whereabouts.——The *Popular Science Review* for July contains some very interesting papers, especially one on "The Study of Chemical Geology," by David Forbes, F.R.S.; one on "Animals between Birds and Reptiles," by Professor Huxley; and one on "The Great Eclipse of August 17th of this Year," by R. A. Proctor, F.R.A.S.——"Iron Ship Building." With practical illustrations. By John Grantham, C.E., &c. Fifth edition, with supplement and index. London: Virtue & Co. 1868. This is an enlarged edition of an elaborately illustrated work, consisting mainly of engravings. The supplement traces the progress made in iron ship-building up to the present time.——"Observations and Suggestions on the Railways of the United Kingdom." By F. B.: Causton & Sons, 47, Eastcheap. The chief object of this pamphlet is to show how the railways may be immediately rendered more serviceable and beneficial to the public generally than they now are, and much more remunerative to their proprietors. This, the author rightly thinks, would be done simply

by low fares and charges, say "for second-class to a rate of one penny for every five miles, and of third-class to one halfpenny for every five miles:" for goods and parcels also the rates to be largely reduced,—parcels under 14 lb. say, for one penny each, and proportionally for greater weights. But why should not first-class passenger fares be also reduced? Second and third class carriages ought to be improved and made more safe, as by means of cheap stuffing or cushioning. Why should the less wealthy classes be less safely conveyed than the more wealthy, or why should they be thus forced to pay more than they can afford? Passengers who can afford first-class tickets are not so placed under the screw to force higher fares out of *them*, although they can as a class far better afford it.

Miscellanea.

BARNSLEY.—At a recent meeting of the local Board of Guardians the clerk read a letter from the Poor-law Board on the subject of the workhouse hospital accommodation, recommending the guardians to take into consideration as early as practicable the erection of an entirely new infirmary, detached from the main building. A committee was appointed to take the matter into consideration, with power to consult an architect and report to a future meeting of the Board.

PRESENTATION TO BISHOP SELWYN.—A few old New Zealand colonists, resident in England, have presented to the Bishop of Lichfield, who has now sailed for New Zealand, a pastoral staff. The staff, executed by Messrs. Cox & Son, of London, is of massive silver, with the top crocketed and jewelled, the knop below the crook pinnacled and chased, and the stem of polished ebony with silver bulb and base. An address was read to the bishop on behalf of the donors by Archdeacon Paul, prebendary of Lincoln.

IMPROVEMENTS IN HIGH HOLBORN.—The crossing from Gray's Inn-road to the south side of Holborn having been rendered highly dangerous to pedestrians since the removal of Middle-row, and consequent widening of the carriage-road for the increased traffic, the Metropolitan Board of Works have caused a cast-iron gas-lamp pillar to be erected in High Holborn, at its junction with the carriage-road of Gray's Inn-road. The pavement around the pillar is raised, so as to afford a place of refuge to persons crossing; this is also inclosed with iron posts, in order to prevent carriages from being driven on the raised pavement. At the Holborn viaduct workmen are actively engaged in filling up the hollows between the arches with gravel dredged from the river, and dry brick rubbish, so as to form a solid foundation, preparatory to being paved with cubic blocks of granite. At the western terminus of the viaduct a pillar is to be erected with brackets, each supporting a lantern with four burners. The place in which the pillar is to stand is of large diameter, perfectly circular, and is intended to afford a place of safety to foot-passengers crossing the main thoroughfare.

GENERAL BUILDERS' ASSOCIATION.—The annual meeting of this Association was held in St. George's Hall, Bradford. Mr. Whiteley presided. The secretary read the reports of sub-committees on the subjects of working rules, the establishment of a builders' fire insurance, the amalgamation of the labour registration offices established by the Association in various towns, and those of the free labour registration of London, and other matters. A lengthy discussion arose on the proposition to approve the working rules drawn up by the sub-committee appointed for that purpose. The first of these rules provides that payment by the hour shall be adopted by all members of the Association on and after the 1st May, 1869, and that due notice of this be given to the operatives. Others of the rules provide that a court of arbitration between employers and employed be formed, and that the rule restricting the use of worked stone be abolished. A very strong feeling in favour of the adoption of the rules was manifested, but it was finally resolved that the report of the sub-committee be referred to the branch associations, and that they send delegates to the September meeting, with power to vote upon the question.

"THE SONG OF THE SHIRT."—The sitting female figure by Mr. Marshall Wood, which under this title attracted deserved attention in the Paris International Exhibition, is now on view in the gallery belonging to Messrs. H. Graves & Co., Pall-mall, and will well repay a visit. The attenuated form, and the care-worn face of the poor shirtmaker are represented with grace as well as touching truth.

BARK-CUTTING MACHINE.—In an article on the Sawmill at Cummertrees, the *Annan Observer*, says:—"The most serviceable improvement that has been introduced into their works by Messrs. Matthews & Boyd, is the bark-cutting machine, invented by Mr. Jonathan Thompson, engineer, Penrith, which can, with only three men to attend it, do the work of forty men and sixty women in the ordinary way by hand."

FIRE ON THE MOORS.—By the fire in Yorkshire nearly 4,000 acres of moorland have been left black and desolate, with probably scarcely a living bird, or animal, or vegetable, excepting the largest trees, over the wide expanse. The grouse and rabbits which abound on these moors have been destroyed, and sheep grazing thereon have in some instances perished. A fire somewhat similar has been burning for the last few days on Chat Moss. The fire has passed over a considerable area.

THE GREAT DOME AT WASHINGTON. — The dome of the Capitol at Washington is the most ambitious structure in America. It is 108 ft. higher than the Washington monument at Baltimore, 68 ft. higher than that of Bunker Hill, and 28 ft. higher than the Trinity Church spire at New York. It is the only considerable dome of iron in the world. It is a vast hollow sphere of iron, weighing 8,200,000 lb. Directly over your head is a figure in bronze, "America," weighing 14,985 lb.—*New York Observer.*

THE ART TREASURES OF WALES.—An Exhibition of Works of Art is being got up at Ruthin, Denbighshire, North Wales, to commence on the 4th of August, and remain open to the public for a month. Mr. Cornwallis West, of Ruthin Castle, is an active promoter of the undertaking; while Mr. Chaffers, the collector, is principal superintendent. The promoters, who in the new townhall at Ruthin have a very convenient set of apartments for the proper display of the collection, are very sanguine of success.

BROUGHAM AND BISMARK.—It is said that the charming château inhabited by the late Lord Brougham at Cannes, is to become the residence of no less a personage than the statesman Herr von Bismark. The story goes that General Bulow, who had just concluded a bargain in the name of the illustrious minister, set to reading the famous distich of Ovid inscribed on the colonnade:—

"Inveni portum; spes et fortuna valete;
Sat me lusistis, ludite nunc alios."

A young gentleman who accompanied him asked, waggishly, if this was to become the motto of the Prussian minister.

THE HOLY SEPULCHRE.—A letter from Jerusalem in the *Moniteur* says:—"The works for the reconstruction of the cupola of the Holy Sepulchre, which have been carried on with extreme rapidity, appear to be approaching their termination. At the end of last year the iron ribs were completed, and the lantern placed on the summit. An idea could then be formed of the elegant proportions of the new dome. The previous edifice, being too flat, had a heavy appearance. The present cupola, being about 6 ft. higher, and surmounted with a cross, rises more conspicuously above the surrounding buildings."

THE BIRMINGHAM WORKHOUSE SCHOOLS.—At a recent meeting of the local guardians, Mr. Biddle said the Poor Law Board's architect and medical examiner of plans had conceded all that the guardians asked in reference to the workhouse schools, except that they wished the building to be a little wider and longer.—Mr. Hawley: And to have a large bath, to teach the boys to swim.—The architects (Messrs. Martin & Chamberlain) reported that they had had two interviews with Dr. Smith, the medical examiner of plans, and Mr. Savage, the architect to the Poor Law Board, with reference to the plans of the proposed new schools for 300 boys. Mr. Hawley moved that the plans, modified in the manner indicated in the report, be sent to the Poor Law Board for their seal. This was agreed to.

CLEAN ROADS.—R. T. writes:—"It is computed that three-fourths of the dirt on the London stones arise from horse-dung, either as pulverized dust or mud. It causes much damage and annoyance, ill-health, and ophthalmia. To remedy the above, I would hook a wire basket with hinged front on the vehicle immediately behind the animal, so that the upward motion of the tail would open the front (by means of a thong fixed to the crupper) to receive the droppings, to be emptied into parish receptacles if necessary. All shop sweepings ought to be thrown into the dust-bin. I hope no squeamisher will expect an apology for this dealing with Nature."

THE PROPOSED PAXTON MEMORIAL AT LEIGHTON BUZZARD.—The members of the Leighton Buzzard Working Men's Mutual Improvement Society have had a meeting at the Cedars, the residence of Mr. J. D. Bassett, where they presented an address to Lord Charles J. F. Russell, advocating his lordship's suggestion, made at the inauguration of the recent industrial exhibition, to establish in this town an educational and popular institute, to be associated with the name of the late Sir Joseph Paxton, as we have before mentioned. It was resolved in course of the proceedings, "that the proposed memorial shall be called 'The Paxton Institute,' and shall be devoted to the advantage of the working-classes and the inhabitants of the locality generally." A committee was appointed to carry into effect the proposed Paxton Institute.

PUBLIC MUSEUMS AND LIBRARIES.—A meeting has been held at the Society of Arts for the purpose of urging upon the Government "the duty of placing upon a footing worthy of national institutions the public museum of inventions and free scientific library connected with the Patent Office." The objects of the association by which the meeting was convened are the opening of the national collections on week-day evenings, and the promotion of the adoption of the Free Libraries and Museums Act. Professor Leone Levi occupied the chair, and was supported by a considerable number of gentlemen interested in promoting the extension of public museums and libraries. Appropriate resolutions were agreed to, including one authorizing the Chairman to petition Parliament through Mr. Layard and Lord Lichfield.

THE LIVERPOOL ARCHITECTURAL SOCIETY AT WYNNSTAY.—The annual excursion of the Liverpool Architectural and Archæological Society took place on Saturday, Wrexham and the neighbouring locality of Wynnstay being the scene of the Society's visit. There were about thirty in the party. After their visit to Wynnstay they partook of dinner at the Wynnstay Arms Hotel, Wrexham. The chair was occupied by Mr. F. Horner, the president, and the vice-chair by Mr. William Hay, one of the vice-presidents; and the company included the Mayor of Wrexham, Mr. Walker. Afterwards the party visited the parish church of Wrexham, and several ascended the tower, from the summit of which a most extensive view of the surrounding country is obtained. Shortly before ten o'clock the visitors left the Wrexham station, and returned by rail to Liverpool.

THE COST OF THE NEW WORKHOUSE FOR SOUTHAMPTON.—At a recent meeting of the local Guardians, a letter was read from the Poor Law Board as to the letter of the Guardians forwarding a statement to show the manner in which the 18,800*l.* borrowed by the Guardians for the erection of the new workhouse had been expended, and also a statement showing the purposes for which the further sum of 7,000*l.* was required. The estimated cost of 4,689*l.* for extra works seemed to the Poor Law Board to be rather large, being nearly 23 per cent. on the amount of the original contract. Before determining what further amount they should authorise the Guardians to borrow, they requested some general particulars of the several items. The Deputy-President thought that the Poor Law Board were not warranted in asking for such information, and that the architect should not be called upon to go into an explanation of detail in matters which should rest for the present entirely with himself and the builder. A committee, however, was appointed to consider the letter, and to furnish the information required by the Poor Law Board. The architect mentioned that there had been matters in connexion with the foundations of the workhouse building that could not be foreseen, and which had tended very considerably to raise the expenses which had been incurred for extras.

ENGINEER OF NEW WORKS FOR ST. PANCRAS GUARDIANS.—The guardians of St. Pancras have elected Mr. S. Tinney for the office of resident engineer and clerk of the works, at the Leavesden Schools, at a salary of 300*l.*, with house, coal, and gas.

SOUTH KENSINGTON MUSEUM.—The number of visitors during the week ending the 4th of July, was, on Monday, Tuesday, and Saturday, free, 14,755; on Wednesday, Thursday, and Friday (admission, 6d.), 3,806; National Portrait Exhibition, by payment, 2,089: total, 20,650.

ARCHITECTURAL AND ARCHÆOLOGICAL SOCIETY OF DURHAM AND NORTHUMBERLAND.—The second general meeting of this Society has been held at Dunstanborough, Bamburgh, and neighbourhood. The committee met at Alnwick at an early hour, and drove *viâ* Rock and Rennington (visiting the churches *en route*) to Embleton. The ruins of Dunstanborough Castle were then visited. A pleasant drive along the coast brought the committee to North Sunderland and Bamburgh, where the castle and churches were inspected. After staying all night at Belford, the committee drove to Old Bewick, by Chatton and Chillingham, where the old chapel and old British camp were visited by the party and described by Mr. Greenwell. The committee dined with Mr. Langlands and several friends at Old Bewick. They returned to Alnwick by way of Eglingham, and reached Newcastle at a late hour after a most pleasant excursion.

METROPOLITAN DRINKING FOUNTAIN ASSOCIATION.—The annual meeting of the members and supporters of this useful association has been held in St. James's Hall. The chair was taken by the Hon. F. Byng. Mr. John Lee submitted the report from the committee. It expressed a hope that the generous support the association had hitherto received would not fail it until public free supplies of water for man and beast were placed in all the leading thoroughfares of the metropolis. The association had now 117 fountains and 99 troughs under its care and supervision, and although they were spread over an area of something like 100 square miles, and were exposed to all the injury which thoughtless mischief, wilful malice, and unavoidable accident could inflict upon them, yet so efficiently had the supervision been carried out that at the present time there was not a single one out of repair. The total amount received during the year had been 3,649*l.*, but of that sum no less than 1,340*l.* had been contributed for memorial fountains of special designs, and on special sites chosen by the donors. The report complained that in the establishment of cattle-troughs the society had not received that amount of support they had a right to expect from the Society for the Prevention of Cruelty to Animals, which had offered simply a sum of 10*l.* for each trough, which was only equivalent to one year's maintenance. Eight fountains and thirty-five troughs had been erected during the year.

THE BATH AND BRISTOL COLLIERY PARTNERSHIP, LIMITED.—The prospectus of this company states that at Twerton, about two miles from Bath, ten miles from Bristol, and 108 miles from London, a colliery has been opened on the Somersetshire coal-field, and the present lessees, Messrs. F. & D. Brown, have expended thereon about 10,000*l.* Seams of coal, seven in number, and of the aggregate thickness of 26 ft., have been discovered, and, to a great extent, placed in order for mining, removal, and sale. The colliery is entirely free from fire-damp, and suffers little or nothing from water. It admits, therefore, of being worked with safety and economy. The colliery is near the Kennet and Avon Canal, and half a mile from the Great Western Railway. It is convenient for the supply of Bristol and Bath, and there is only one colliery nearer the metropolis. The proprietors desire to complete and extend the works by the addition of a second shaft, and other arrangements, for effecting with greater economy large and profitable deliveries of coal. These objects it is thought may be best obtained through the instrumentality of a small limited partnership. The partners would have to provide a capital of 26,000*l.* On this capital it is calculated that a net annual profit would be earned of 16,920*l.*, enabling a dividend to be paid of 30 per cent., and leaving a sum for reserve, improvements, and extensions. The proposed capital of the company is 35,000*l.* This is probably the first partnership under the Limited Liability Act brought out for public participation without any board of directors, solicitor, &c.

MR. LONGFELLOW.—Mr. John Watkins, of Parliament-street, has made some excellent photographic portraits of this distinguished poet. On Tuesday last, Mr. Longfellow sat to Mr. E. Goodwyn Lewis for a crayon portrait.

THE DEBTS OF THE METROPOLITAN BOARD OF WORKS.—The total amount borrowed up to January last was 8,073,000*l.*, of which 1,520,633*l.* 6s. 8d. have been repaid, leaving the sum of 6,552,366*l.* 13s. 4d. still outstanding. The rates of interest at which the money has been borrowed vary from 3½ to 4½ per cent.

THE OPENING OF THE ABBEY MILLS PUMPING STATION OF THE METROPOLITAN DRAINAGE WORKS.—It was announced at the last meeting of the Metropolitan Board of Works that, as the Duke of Edinburgh could not open the Abbey Mills Station, there would be no public opening and no invitation to members of Parliament.

DEATH OF THE INVENTOR OF THE REAPING MACHINE.—Mr. John Common, of Denwick, near Alnwick, has recently died, in the 91st year of his age. He is held to be entitled to renown for his many useful inventions and improvements in agricultural implements, especially for the American Reaper, of which he is known as the original inventor.

PROPOSED REMOVAL OF BILLINGSGATE MARKET. A proposal is now before the Corporation of the City of London for the removal of this ancient market to some central part of the City, where it can be brought in direct communication with various railroads. The Markets Committee of the Common Council have reported that the most eligible situation would be in connexion with Farringdon Market, or some spot adjoining or near the new Meat and Poultry Market at Smithfield.

THE PROPOSED NEW ASYLUM IN WARWICKSHIRE FOR IDIOTS.—The committee appointed at the last sessions to consider the question of founding a new Asylum for Idiots has presented to the Court of Quarter Sessions for the county plans and estimate for the new building, which had been prepared under the guidance of Dr. Parsey, the medical superintendent of the county asylum. The estimate was 10,000*l.* The purchase of the land had been completed for 1,500*l.* The committee recommended that the plans should be forthwith forwarded to the Commissioners in Lunacy for approval. The report was received and adopted. The site of the new building is close to the present asylum at Hatton.

HYDE PARK AND FINSBURY PARK.—In reply to questions in the House of Commons, Lord J. Manners said that it was not proposed to cut down any more trees of the slightest importance in the present year for the purpose of making a drive in Hyde Park to the north of the Albert Memorial. It was only proposed this year to make the drive at the south side of the Albert Memorial, to rebuild the lodge at the other side of the Queen's-gate, and also to carry the drive from the Serpentine straight across to the Exhibition-road. Next year it would be necessary to propose a further vote for relaying the grounds to the north of the Albert Memorial, on which occasion explanations would be given of the intentions of the Government. As to Finsbury Park, Mr. Tite said that the Finsbury Park Act dated ten years back, at which time the Government of the day undertook to defray half the cost of the park. In consequence of the opposition and rejection of the first vote of 50,000*l.* towards the expense of the park, the Board had an extremely difficult duty thrown upon them, for they had not only to pay the original outlay but also to maintain the park. The Board, therefore, decided, instead of purchasing 230 acres, to purchase 130; and they were now enclosing the ground at a cost up to the present of 94,000*l.*, but which would exceed 100,000*l.* before the work was completed. With the view of diminishing the cost to the ratepayers, the Board had resolved to lay out a portion of the land for building purposes, without, however, damaging the larger area of the park, which amounted to 110 acres.

TENDERS.

For alterations and additions to a detached house at Stamford-hill. Mr. Herbert Ford, architect. (No quantities):—

Hayworth	£703 0 0
Kent	696 0 0
Lewis	682 0 0
Crabb & Vaughan	584 0 0
Preedy & Son	498 0 0

For alterations and additions to house No. 240, Blackfriars-road. Mr. George Ferry, architect:—

Parman & Fotheringham	£1,225 0 0
Axford	1,175 0 0
Gadsby	1,015 0 0
Bishop	993 0 0
Bamford	979 0 0
Langmead & Way	970 0 0
Macey (accepted)	949 0 0

For a lodge at Erith, Kent. Mr. Herbert Ford, architect. (No quantities):—

Relph	£187 5 0
Grumbrell	180 0 0
Willis	167 0 0
Catchpole (accepted)	164 0 0

For alterations to Star Life Assurance Office, Moorgate-street, City:—

Weekes	£3,090 0 0
Dove	2,950 0 0
Clemmens	2,900 0 0
Bennett	2,880 0 0
Clough	2,875 0 0
Nixon	2,795 0 0
Colls	2,550 0 0

For villa at Lower Sydenham, for Mr. G. Sully:—

Merritt & Ashby (accepted)	£446 0 0

For new chancel, spire, roofs, &c., and restoring St. Mary's Church, Warkworth, Northamptonshire. Mr. C. H. Driver, architect. Quantities by Mr. R. O. Harris:

Jackson & Shaw	£4,180 0 0
Orchard	3,988 0 0
Kimberly	3,790 0 0
Davis, Brothers	3,693 0 0
Franklin & Son	3,450 0 0

For additions to Grove Hall Lunatic Asylum. Messrs. Tolley & Dale, architects:—

Fawcett	£2,449 0 0
Rivett	1,873 0 0
Perry & Co.	1,707 0 0
Pritchard	1,697 0 0
Abraham	1,696 0 0
Hill, Keddall, & Waldram	1,668 0 0
Hedges (accepted)	1,596 0 0

For alterations, &c., to premises, Southwark-street. Mr. N. S. Joseph, architect:—

Conder	£503 0 0
Hill & Keddel	482 0 0
King & Sons	453 10 0
Newman & Mann	403 0 0

For Sandy National schools, Beds. Messrs. Wm. & Habershon & Pite, architects:—

Cowland	£1,900 0 0
Pattinsons	1,900 0 0
Carter & Son	1,870 0 0
Cunvin	1,737 0 0
Twelvetrees	1,678 0 0
Field	1,595 0 0

For alterations and additions to the vicarage-house Mucking, Essex. Mr. Charles Innes, architect:—

Carter & Sons	£949 0 0
Place	895 0 0
Rivett	883 0 0
Blake	796 0 0
Davey	769 0 0
Lilleystone	730 0 0

For villa residence, St. Peter's-road, Croydon. Mr Brooks, architect:—

Henshaw	£2,128 0 0
Goodwin	2,049 0 0
Holledge	1,925 0 0
Langmead & Way	1,750 0 0
Wells	1,744 0 0
Cowland	1,690 0 0

For country house at Wantage, Berks, for Mr. F. F. Bullock. Mr. J. P. Spencer, architect. Quantities supplied:—

Briant	£3,213 0 0
Dover & Co.	3,000 0 0
Nightingale	2,727 0 0

For alterations and additions to 19, Great Windmill-street, for Mrs. Kemp. Messrs. Glazier & Son, architects:

Corbett	£236 0 0
Nightingale	227 0 0
Batchelor	177 0 0

For national schools, Hurst Pierpoint, Sussex. Messrs. Goulty & Gibbins, architects:—

Stanbridge	£2,289 0 0
Lockyer	2,106 0 0
Chappell	2,075 0 0
Cheesman	2,070 0 0
Howell	2,058 0 0
Kirk	1,970 0 0
Nash & Co.	1,922 0 0
Nightingale	1,883 0 0
Hall & Co.	1,870 0 0
Holland (accepted)	1,867 0 0
Wadey	1,643 0 0

For the erection, above basement, of house, for Dr. Edward Davies, in Grosvenor-road, Wrexham. Mr. Edward Jones, architect:—

Samuels	£2,350 0 0
Owens	2,200 0 0
Rogers	2,155 0 0
Rogers (with alteration)*	2,119 0 0

* Accepted.

For two brick bridges and four iron and brick bridges, proposed to be built at Goldings, near Hertford. Mr. John B. Badock, architect and engineer:—

Fleet & Newey	£10,595 12 6
Dixon	9,180 0 0
Floyd	7,460 0 0
Crampton	7,220 0 0
Shaw, Head, & Co.	7,110 0 0
Gooch	6,980 0 0
Clarke	6,686 0 0
Jackson	6,119 0 0